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May 2005

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HIV/AIDS EPI Updates

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Acknowledgements

National level HIV and AIDS surveillance is possible as a result of all provinces and territories participating in, and setting directions for, HIV and AIDS surveillance. Accordingly, the Centre for Infectious Disease Prevention and Control acknowledges the provincial/territorial HIV/AIDS coordinators, public health units, laboratories, health care providers and reporting physicians for providing the non-nominal confidential data that enable this report to be published. Without their close collaboration and participation in HIV and AIDS surveillance, the publication of this report would not have been possible. The Centre for Infectious Disease Prevention and Control also acknowledges the contributions of many researchers, community members, and non-governmental organizations, including the Canadian AIDS Society, for their valuable inputs and comments during the preparation of this report.

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Information to the readers of *HIV/AIDS Epi Updates*

The Surveillance and Risk Assessment Division of the Centre for Infectious Disease Prevention and Control, Public Health Agency of Canada, is pleased to provide you with the May 2005 publication of *HIV/AIDS Epi Updates*.

The Centre conducts national surveillance and research on the epidemiology and laboratory science related to HIV/AIDS. As part of this mandate, *HIV/AIDS Epi Updates* are compiled on an annual basis to summarize recent trends and developments related to the HIV epidemic in Canada.

All *Epi Updates* are available at the address noted above and also at our website: www.phac-aspc.gc.ca/hast-vsmt/. The *HIV/AIDS Epi Updates* are complementary to other Centre materials, which are also available at the website.

Sincerely,

Chris Archibald MDCM, MHSc, FRCPC
Director

Centre for Infectious Disease Prevention and Control

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HIV/AIDS
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Centre for Infectious Disease Prevention and Control

National HIV Prevalence and Incidence Estimates for 2002

At a Glance

- **An estimated 56,000 people in Canada were living with HIV infection (including AIDS) at the end of 2002, which represents a 12% increase from the estimate of 49,800 at the end of 1999.**
- **In Canada, there were an estimated 2,800 to 5,200 new HIV infections in 2002, approximately the same as in 1999.**

CIDPC Website:

www.phac-aspc.gc.ca/hast-vsmt/

Introduction

This Epi Update outlines the estimates of the total number of Canadians who were living with HIV infection at the end of 2002 (prevalence) and the number of individuals who became newly infected in 2002 (incidence). It updates estimates produced in 1999. National estimates of HIV prevalence and incidence are an integral part of the work carried out by the Centre for Infectious Disease Prevention and Control (CIDPC). They are used as a tool to monitor the HIV epidemic and to help evaluate and guide prevention efforts, and they are part of ongoing risk assessment and management work conducted by the Centre. It is anticipated that the next set of national HIV estimates will pertain to the year 2005 and will be produced during 2006.

Methods

Methods to estimate prevalence and incidence at the national level are complex and uncertain. The methods used are described below and have been given in detail previously.[1] They are similar to methods that have been used in the USA[2] and internationally.[3]

The four provinces that account for over 85% of the population of Canada and over 95% of reported HIV and AIDS diagnoses are Ontario, Quebec, British Columbia and Alberta. Separate HIV prevalence and incidence estimates were produced for each of these four provinces for each exposure category: men who have had sex with men (MSM), injecting drug users (IDU), MSM-IDU, heterosexual (heterosexual contact with a person who is either HIV-infected or at risk of HIV, heterosexual as the only identified risk, or origin in a country where HIV is endemic) and other (recipients of blood transfusion or clotting factor,

perinatal and occupational transmission). Methods to estimate prevalence and incidence are based on a combination of different methods and incorporate data from a wide variety of sources, such as AIDS case reports, provincial HIV testing databases, population-based surveys, targeted epidemiologic studies and census data. After the calculation of draft estimates by means of these methods, experts in each of the four provinces, including public health officials, researchers and community representatives, were consulted. On the basis of this valuable feedback, the provisional estimates were improved.

HIV prevalence was estimated by using the three methods for each of the four provinces by exposure category. Using Method 1 (direct method), the number of prevalent infections was calculated by multiplying the prevalence rate by the estimated population size (total population for that group). Methods 2 and 3 (indirect methods) were used together to estimate HIV prevalence; they were both based on the number of HIV diagnoses and on information about HIV testing behaviour. In Method 2, the cumulative number of HIV diagnoses less cumulative AIDS deaths was divided by the proportion of the population that had ever been tested for HIV. In Method 3, the number of HIV diagnoses in 2002 was divided by the proportion of the population that had been tested for HIV within the previous year. The result was then added to the cumulative number of HIV diagnoses to the end of 2001 less cumulative AIDS deaths, plus an estimate for 2002 HIV incidence.

The number of incident infections was derived by multiplying the incidence rate by the estimated population at risk (total population for that group minus those already infected with HIV).

Results

Prevalence Estimates

More people are living with HIV infection (prevalent infections). At the end of 2002, there were an estimated 56,000 (46,000-66,000) people in Canada living with HIV infection (including AIDS), which represents an increase of about 12% from the point estimate of 49,800 at the end of 1999 (Table 1). In terms of exposure category, these prevalent infections in 2002 comprised 32,500 MSM (58% of total), 11,000 IDU (20% of total), 10,000 heterosexuals (18% of total), 2,200 MSM/IDU (4% of total), and 300 attributed to other exposures (< 1% of total) (Table 1).

Incidence Estimates

The number of new infections (incident infections) continues at approximately the same rate as three years ago. In Canada, there were an estimated 2,800 to 5,200 new HIV infections in 2002 compared with the estimate of 3,310 to 5,150 in 1999 (Table 2). Examining the estimates for 2002 by exposure category, it is clear that MSM continue to account for the greatest number of new infections, 1,000 to 2,000. This represents about 40% of the national total of new

Table 1. Estimated number of prevalent HIV infections in Canada and associated ranges of uncertainty at the end of 2002 compared with 1999 (point estimates and ranges are rounded)

	MSM	MSM-IDU	IDU	Heterosexual	Other	Total
2002	32,500 (26,000-39,000)	2,200 (1,500-3,000)	11,000 (8,500-13,500)	10,000 (7,000-13,000)	300 (200-400)	56,000 (46,000-66,000)
1999	29,600 (26,000-33,400)	2,100 (1,700-2,600)	9,700 (8,100-11,800)	8,000 (6,300-10,100)	400 (330-470)	49,800 (45,000-54,600)

MSM: men who have sex with men; IDU: injecting drug users; heterosexual: heterosexual contact with a person at risk of HIV, origin in a country where HIV is endemic or heterosexual as the only identified risk; other: recipients of blood or blood products, perinatal and occupational transmission

Table 2: Estimated ranges of uncertainty for number of incident HIV infections in Canada in 2002, compared with 1999 (ranges are rounded)

	MSM	MSM-IDU	IDU	Heterosexual	Other*	Total
2002	1,000-2,000	150-350	800-1,600	600-1,300	< 20	2,800-5,200
1999	1,190-2,060	190-360	1,030-1,860	610-1,170	< 20	3,310-5,150

*New infections in the Other category are very few and are primarily due to perinatal transmission.

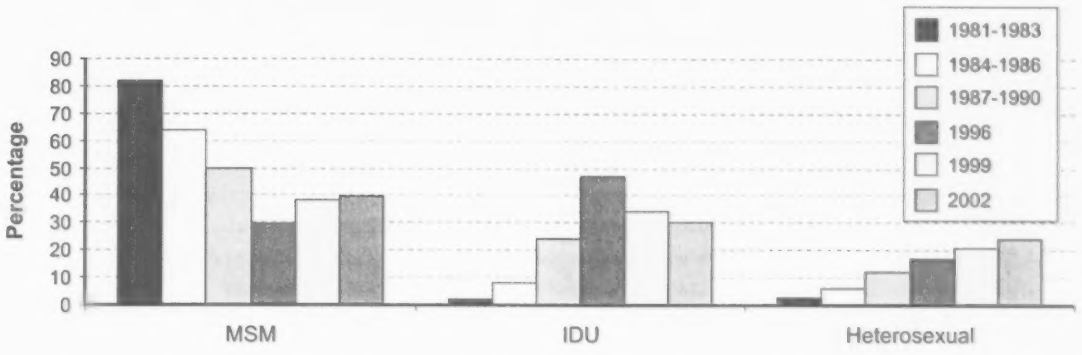
infections, which is a slight increase from the 38% estimated in 1999 (Figure 1). The proportion of new infections attributable to IDU has decreased slightly, from 34% of the total in 1999 to 30% in 2002 (800-1,600 new infections in 2002). The proportion attributed to the heterosexual exposure category increased slightly, from 21% in 1999 to 24% in 2002 (600-1,300 new infections in 2002).

Figure 1 shows how the exposure category distribution of new HIV infections has changed since the beginning of the HIV epidemic in Canada. Until 1996, there was a steady increase in the proportion of new infections attributed to IDU, and since then this proportion has decreased. Conversely, the proportion attributed to MSM steadily declined until 1996 and has increased since then. The proportion of new infections attributed to the heterosexual exposure category has increased steadily since the beginning of the epidemic.

Trends among Women

At the end of 2002, there were an estimated 7,700 (6,500-9,000) women living with HIV in Canada, (including those living with AIDS), accounting for about 14% of the national total. This represents a 13% increase from the 6,800 estimated in 1999. There were 600 to 1,200 new HIV infections among women in 2002, representing 23% of all new infections, a finding similar to that in 1999. With respect to the exposure category distribution among newly infected women, a slightly higher proportion of new infections was attributed to the heterosexual category in 2002 compared with 1999 (53% vs. 46% respectively). The remainder of new infections among women was attributable to IDU.

Figure 1. Estimated exposure category distributions (%) among new HIV infections in Canada, by time period



MSM: men who have sex with men; IDU: injecting drug users; Heterosexual: subcategories of heterosexual contact with a person at risk of HIV, origin in a country where HIV is endemic, and heterosexual as the only identified risk. A different method was used prior to 1996.

1

Trends among Aboriginal Persons

In 2002, it was estimated that approximately 3,000 to 4,000 Aboriginal persons were living with HIV in Canada. This represents about 5% to 8% of all prevalent HIV infections, compared with the 1999 estimate of about 6% of the total, or 2,500 to 3,000 persons. Aboriginal persons accounted for approximately 250 to 450 of the new HIV infections in Canada in 2002, or 6% to 12% of the total, compared with 9% in 1999. The composition of exposure category among Aboriginal persons newly infected in 2002 was similar to that in 1999. The distribution in 2002 was 63% IDU, 18% heterosexual, 12% MSM and 7% MSM-IDU.

Persons from HIV-endemic Countries within the Heterosexual Exposure Category

As already outlined, the heterosexual exposure category is a diverse group that includes those who have had sexual contact with a person at risk of HIV (such as an IDU or a bisexual male), those who were born in a country where HIV is endemic, and those who have not identified any risk apart from sexual contact with the opposite sex. On the basis of the proportions in positive HIV test reports and reported AIDS cases, it is estimated that in 2002 there were approximately 3,700 to 5,700 prevalent HIV infections, and 250 to 450 incident infections among persons who were born in a country where HIV is endemic. These numbers represent approximately 7% to 10% of total prevalent infections and 6% to 12% of total incident infections in Canada. We are currently collaborating with provincial/territorial partners, researchers and community groups to explore ways to better understand the current status and trends of HIV infection in this group.

Undiagnosed HIV Infections: the Hidden Epidemic

Using methods described elsewhere,[1,2] it was estimated that of the 56,000 prevalent infections in 2002, about 17,000 (13,000-21,000) or 30% were unaware of their HIV infection (see section 2. Prevalent HIV Infections in Canada). The number of persons in this group is especially difficult to estimate because they are "hidden" to the health care and disease monitoring systems, since they have not yet been tested for HIV infection and their condition diagnosed. This group is particularly important because until their infection has been diagnosed, they cannot take advantage of available treatment strategies or appropriate counselling to prevent the further spread of HIV.

Comments

The methods that were used to estimate HIV prevalence and incidence make maximum use of a wide variety of data. Producing these national estimates is becoming increasingly difficult because of the existing limitations associated with HIV surveillance data and the limited availability of research data specific to HIV incidence, prevalence and the population size of risk groups. Limitations associated with HIV surveillance in Canada are currently being addressed in collaboration with our provincial/territorial partners and community groups. Epidemiological research in Canada needs to be strengthened to provide information that will help improve the estimates. To reflect the challenges associated with the data, the presentation of the 2002 estimates differs from previous years, in that more emphasis is placed on ranges rather than point estimates, especially in the case of incidence, for which data on recent trends are more limited. Given the information we have, however, we believe that this is an accurate picture of the state of the epidemic in Canada.

Available data show that more Canadians are living with HIV infection, and the overall rate of new infections in 2002 was approximately the same as in 1999. MSM continue to be the most affected group, and new infections among IDU continue to decline slightly. Infections attributed to the diverse heterosexual exposure category continue the gradual increase seen previously. The reasons

for these trends need to be better understood. It is clear that the number of new infections in all exposure categories remains unacceptably high. Findings also indicate that there are a large number of people in Canada who are unaware of their HIV infection and that Aboriginal persons are still overrepresented in terms of HIV infections in Canada.

Greater vigilance is needed if we are going to successfully control the HIV epidemic in Canada. This includes more effective strategies to prevent new infections in all risk groups and to provide services to the increasing number of Canadians living with HIV infection, particularly those who are vulnerable and disadvantaged. In addition, there is an increasing need to address the limited availability of data in order to better understand and monitor the full scope of the HIV epidemic in Canada.

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National level HIV and AIDS surveillance is possible as a result of all provinces and territories participating in, and setting directions for, HIV and AIDS surveillance. CIDPC acknowledges the provincial/territorial HIV/AIDS coordinators, public health units, laboratories, health care providers, and reporting physicians for sharing non-nominal, confidential data for national surveillance.

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2

Prevalent HIV Infections in Canada: 30% May Not Be Diagnosed

At a Glance

- **There were an estimated 56,000 people living with HIV infection (including AIDS) in Canada at the end of 2002.**
- **Of these, approximately 17,000 or 30% are not aware of their infection.**

CIDPC Website:

www.phac-aspc.gc.ca/hast-vsmt/

Introduction

This *Epi Update* presents the estimated number of Canadians who were HIV-infected but unaware of their infection at the end of 2002. It also summarizes available data on the characteristics of persons tested for HIV in Canada. It is anticipated that the next set of national HIV estimates will pertain to the year 2005 and will be produced during 2006.

HIV Testing in Canada

Knowledge of one's HIV status can be useful for several reasons:

- Counseling received at the time of HIV testing can provide critical information about how to reduce the risk of HIV infection.
- If an individual is found to be HIV-infected, consideration can be given to starting antiretroviral therapy.
- In the case of pregnant women, treatment can reduce the chances that the infant will be infected, from about 25% to 8% or less.[1]

Canadians have had the opportunity to be tested for HIV infection in Canada since the test became available in 1985. Individuals have accessed HIV testing services through either coded or confidential testing at a doctor's office or clinic, or through anonymous testing sites.

Positive HIV test report data are provided by all provinces and territories in Canada to the Centre for Infectious Disease Prevention and Control (CIDPC) and are presented in the most recent semi-annual report:[2] *HIV and AIDS in Canada: surveillance report to June 30, 2003*. They are based on non-nominal, confidential HIV testing information with duplicate tests for the same individual removed to the extent possible. The removal of duplicates is necessary to accurately reflect the

annual number of new HIV diagnoses. Duplicate removal rates vary by year, province and type of data (nominal, non-nominal, or anonymous). It is important to note that in most provinces the ability to remove duplicates has improved significantly since 1995.

HIV-infected but Unaware

There have been 52,680 positive HIV tests reported to CIDPC up to December 31, 2002.[2] After adjustment for under and delayed reporting, it is estimated that approximately 57,000 Canadians have tested positive for HIV from 1985 (when testing became available) to the end of 2002. Of this total, an estimated 18,000 individuals had died by the end of 2002 (also adjusted for under and delayed reporting), therefore, of this 57,000 approximately 39,000 individuals were aware of their HIV infection and were still alive at the end of 2002.

It is important to note that data on positive HIV tests represent only those who have tested positive for HIV infection and do not represent all persons who have been infected with HIV, as some who have been infected have not yet come forward for testing.

In December 2003, CIDPC published estimates of HIV prevalence in Canada to the end of 2002.[3] It was estimated that approximately 56,000 (46,000-66,000) Canadians were living with HIV infection (including those living with AIDS) at the end of 2002. This number includes those who are aware of their infection (had a positive HIV test) and those who are unaware of their infection.

The difference between the total number who were HIV-infected and alive at the end of 2002 (56,000) and the number who were aware of their HIV infection and alive at the end of 2002 (39,000) represents an estimate of the number of persons unaware of their infection (had not yet tested positive for HIV) and alive. This difference is approximately 17,000 (13,000-21,000) or about 30% of the estimated 56,000 Canadians living with HIV infection at the end of 2002.

Characteristics of Persons Tested for HIV

A Canada-wide survey conducted in March 2003 of randomly selected individuals above 15 years of age revealed that just over one-quarter (27%) reported ever having been tested for HIV, excluding testing for the purposes of insurance, blood donation, and participation in research.[4] In this survey, women were more likely to have been tested than men (29% vs. 24%), and among people who reported having been tested, 42% had not been tested in the previous two years, 38% had been tested once in the previous two years and 18% had been tested twice or more in the previous two years.

The figures from this 2003 survey show that a higher proportion of individuals reported having been tested as compared with the results of a Canada-wide survey conducted in January 1997, when it was found that 18.6% of men and 16.2% of women aged 15 years and older had been tested for HIV (excluding tests for blood donation and insurance purposes).[5,6] Of those tested, 39% had been tested in the year before the survey, 57% in the previous two years, and 43% had had their most recent test more than 2 years before the survey. A 1996 survey found that, taking into account ancillary testing such as donating blood or being tested for life-insurance purposes, 41% of men and 31% of women in Canada had ever been tested for HIV.[7]

National surveys of the general population suggest that those who report risk factors are more likely to be tested:

- Among heterosexuals, those with two or more partners in the previous year were more likely to be tested than those with one partner (50.5% vs. 17.4%). Of those who reported having had a sexually transmitted infection (STI) in the previous five years, 58% had been tested compared with 17.4% of those who did not report an STI.[5,6] The percentage of Canadians being tested is higher among individuals who reported casual partners (45%); this per-

centage increases with the number of partners, from 30% among individuals reporting one partner to 41% among those reporting two partners and 51% among those reporting three partners.[4]

- For men, testing was higher among those who had had sexual intercourse with men (71%), used injecting drugs (62%), received blood or clotting factor between 1978 and 1985 (27%), or had had a partner with a risk factor (injecting drug user [IDU], received blood or clotting factor between 1978 and 1985, origin in country endemic for HIV) (30%).[5,6] For women, testing was higher among those who had received blood or clotting factor between 1978 and 1985 (32%), had had a high-risk partner (38%), or had had sexual intercourse with a man since 1978 (17%).[7]

- Testing was highest among individuals aged 25 to 34 years. Even after all other risk factors are taken into account, those aged 45 years and over were still less likely to be tested than those younger than 45 years.[5-7] In the survey conducted in March 2003, Canadians aged 25-34 years and 35-44 years were more likely to be tested (46% and 35% respectively).[4]

- Targeted studies have shown that a large proportion of individuals among high-risk populations have been tested for HIV, though it is possible that some were tested for the purpose of participation in research. Among men who have sex with men (MSM) surveyed in B.C. in 2002, the proportion that reported ever having been tested was 89%.[8] In a large survey of MSM in Ontario in 2002, 77.7% reported ever having had an HIV test.[9] In the I-TRACK survey of IDU conducted at selected centres across Canada in 2002-03, 89.7% of IDU reported having been tested for HIV.[9]

- Although those reporting risk factors such as IDU, multiple partners, or MSM are more likely to be tested, a substantial proportion of those reporting risk factors have not been tested recently, or have not been tested at all. For example, in the 1997 survey, among those who reported more than one partner in the previous year and not using condoms consistently, 53% of men and 38% of women had never been tested.[5,6]

Comment

Canadians with risk factors for HIV infection are more likely to have been tested for HIV than those without such risk factors; however, there is still a significant proportion of persons with risk factors who have never been tested for HIV. It has been estimated that there are approximately 17,000 people or 30% of the HIV-infected population who are unaware that they are infected. More information is needed about individuals who are at risk of HIV but have not been tested. Given these data and the fact that new treatments are available for HIV infection, it is more important than ever that all Canadians are able to access HIV counseling and testing services, particularly those at high risk for HIV infection.

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3

HIV Testing and Infection Reporting in Canada

At a Glance

- **Nominal, non-nominal, and anonymous HIV testing are available in Canada.**
- **Although anonymous testing may encourage testing, it is not available in all provinces and territories.**
- **HIV infection is notifiable, in all provinces and territories, as of May 1, 2003.**

CIDPC Website:

www.phac-aspc.gc.ca/hast-vsmt/

Introduction

There have been 19,468 AIDS cases reported to the Centre for Infectious Disease Prevention and Control (CIDPC) between 1979 and June 30, 2004, and 56,523 positive HIV tests reported between 1985 and the end of June 2004.[1] The positive HIV test results reported to CIDPC are from people who test positive for HIV through nominal, non-nominal or anonymous testing in the provinces and territories and whose results are reported to CIDPC by their respective health authority or HIV testing laboratory.

This *Epi Update* summarizes the most current information on the reporting of HIV infection in Canada, including the types of HIV testing available and when HIV infection reporting became notifiable in each province and territory. A notifiable disease is one that is considered to be of such importance to public health that its occurrence is required to be reported to public health authorities. (The terms notifiable and reportable are used interchangeably when discussing HIV/AIDS reporting in Canada.)

HIV infection is notifiable across Canada

- As of May 1, 2003, HIV infection became legally notifiable in all provinces and territories, therefore now both positive HIV test reports and AIDS diagnoses are notifiable in all jurisdictions across Canada.
- In most testing situations, laboratories and physicians are responsible for reporting HIV infection, but this varies by province or territory.
- When HIV infection is notifiable, "nominal/name-based" or "non-nominal/non-identifying" information about an individual who tests positive for HIV

infection is forwarded to provincial or territorial public health officials. This includes demographic data, such as the person's age and gender; risks associated with the transmission of HIV; and laboratory data, such as the date of the person's first positive HIV test.

- HIV infection is not legally notifiable at the national level, yet notification to CIDPC is voluntarily undertaken by all provinces and territories. Positive HIV test reports and reported AIDS cases are provided non-nominally to CIDPC.

- HIV testing patterns within the general population, along with the profile of people being tested, are important for designing and targeting intervention programs[2] and for developing a context for HIV/AIDS surveillance data.

Three types of HIV testing available in Canada

Canadians choosing to be tested for the presence of HIV infection may have three different testing options, depending on the province or territory in which testing takes place: **Nominal**, **Non-Nominal**, or **Anonymous**.

1. Nominal/name-based HIV Testing

- May be carried out at numerous locations, including clinics and the office of a health care provider.
- The person ordering the test knows the identity of the person being tested for HIV.
- The HIV test is ordered using the name of the person being tested.
- There is a collection of patient information such as age, gender, city of residence, name of diagnosing health care provider, country of birth, information detailing the HIV-related risk factors of the person being tested; and laboratory data. The amount of information collected varies according to the province/territory.
- If the HIV test result is positive, the person ordering the test is obligated by law to notify public health officials of the positive test result.
- The test result is recorded in the health care record of the person being tested.

2. Non-Nominal/Non-Identifying HIV Testing

- Similar to nominal/name-based testing with one exception: the HIV test is ordered using a code or the initials of the person being tested (not including the full or partial name).

3. Anonymous Testing

- Usually available at specialized clinics, organized and supported by public health departments, and by some health care providers.
- The person ordering the HIV test does not know the identity of the person being tested for HIV.
- The HIV test is carried out using a code. The person ordering the HIV test and the laboratory carrying out the testing on the blood sample do not know to whom the code belongs. Only the person being tested for HIV knows the unique, non-identifying code.
- Information such as age, gender, HIV-related risk factors and the ethnicity of the person being tested for HIV may be collected during anonymous testing, depending on the province or territory in which the test is ordered or on the test site.
- Test results are not recorded on the health care record of the person being tested. It is only the person being tested who may subsequently decide to give his or her name and include the HIV test result in the medical record.

The types of HIV testing services available and HIV infection reporting information across Canada are summarized in Table 1.

Table 1. HIV testing and HIV reporting by province/territory

Province/ territory	Type of HIV testing available	Year in which HIV infection became notifiable	Responsibility for reporting of HIV infection	Type of testing reported to the province/ territory
British Columbia	N, NN, A	2003	L, P	N, NN*
Yukon	N, NN	1995	P	N
Northwest Territories	N, NN	1988	L, P, RN	N
Nunavut	N, NN	1999	L, P, RN	N
Alberta	N, NN, A	1998	L, P	NN
Saskatchewan	N, NN, A	1988	L, P	NN
Manitoba	NN	1987	L, P	NN
Ontario	N, NN, A	1985	L, P	N, NN*
Quebec	N, NN, A	2002	L, P	NN
New Brunswick	N, NN, A	1985	L, P, RN	NN
Nova Scotia	N, NN, A	1985	L, P	N, NN
Prince Edward Island	N, NN	1988	L, P, RN	N, NN
Newfoundland and Labrador	N, NN, A**	1987	L, P	N

N = nominal/name-based
A = anonymous
P = physician
NN = non-nominal/non-identifying
L = laboratory
RN = nurse

*In Ontario and British Columbia, data from positive HIV tests completed by means of anonymous HIV testing (AHT) are reported non-nominally at the provincial level.

**If someone tests positive for HIV through AHT, that individual then becomes part of the nominal/ name-based system, in which counselling, follow-up care and HIV data reporting are all done nominally.

The availability of anonymous HIV testing (AHT) may increase testing

Information regarding the status of anonymous HIV testing in Canada is summarized in Table 2.

- As anonymous testing offers the highest degree of confidentiality, it may encourage more people to come forward for HIV testing and counselling.[3]
- An evaluation study of AHT in Ontario suggested that AHT provides testing to populations that are not otherwise accessing it.[4]
- In Ontario, the proportion of HIV testing done anonymously has remained steady since 1992, at approximately 4%.[5]
- In Quebec, between 1994 and 1998, over 45% of the anonymous test users declared that the anonymity of the test was one of their primary reasons for getting tested.[6]
- Several studies in the USA have shown that AHT programs encourage people to be tested for HIV infection, especially those at high risk or those who would not volunteer for testing under nominal/name-based or non-nominal/non-identifying circumstances.[7-9]
- Interviews of 835 patients with newly diagnosed AIDS in the USA revealed that the availability of anonymous testing was associated with testing closer to the time of HIV infection and, thus, earlier access to medical care.[10]

Table 2: Status of anonymous HIV testing (AHT) by province/territory

Province/territory	Year in which AHT became available	Number of AHT sites	AHT data reported to CIDPC	Counselling services available
British Columbia	1985	Any physician's office	Yes	Yes
Yukon	—	—	—	—
Northwest Territories	—	—	—	—
Nunavut	—	—	—	—
Alberta	1992	3	Yes	Yes
Saskatchewan	1993	3	No	Yes
Manitoba	—	—	—	—
Ontario	1992	33	Yes	Yes
Quebec	1987	60+	No	Yes
New Brunswick	1998	7	—	Yes
Nova Scotia	1994	1	No	Yes
Prince Edward Island	—	—	—	—
Newfoundland and Labrador*	—	6	Yes†	Yes†

* AHT is available upon request but is not part of the official guidelines for the province.

† If someone tests positive for HIV infection through AHT, that individual then becomes part of the nominal/name-based system, in which counselling, follow-up care and HIV data reporting are all done nominally.

Comment

HIV infection is now legally notifiable in all provinces and territories; however, each has a different practice for reporting HIV infection. Legislation of HIV infection reporting in all Canadian provinces and territories may increase the number of tests received at CIDPC. A change to mandatory reporting of HIV infection in Alberta in 1998 resulted in a significant increase in HIV tests among both men and women.[11] As a result, having HIV notifiable across Canada should allow for the collection of more complete epidemiological data as well as enable more accurate and timely monitoring of the HIV epidemic.

All provinces and territories in Canada offer at least one of three forms of HIV testing: 1) nominal/name-based, 2) non-nominal/non-identifying, and/or 3) anonymous testing. At present, nominal/name-based and non-nominal/non-identifying HIV testing is widely available in Canada; however, anonymous HIV testing is available in only eight provinces. Increased availability and accessibility to different types of HIV testing may allow individuals to choose the testing and counselling environment in which they feel most comfortable, thereby encouraging more people to be tested and facilitating the targeting of intervention and treatment programs.[12]

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HIV and AIDS among Youth in Canada

4

At a Glance

- **Youth represents a small proportion of the total number of reported HIV and AIDS cases in Canada. Individuals between the ages of 10 and 24 account for 3.4% of cumulative AIDS cases. For positive HIV test reports, youth between the ages of 15 and 19 account for 1.4% of all reports. In spite of these low proportions, risk behaviour data on young Canadians show the potential for HIV transmission.**
- **A national study showed that approximately 50 to 60% of grade nine and 11 students think there is a vaccine available to prevent HIV/AIDS. The same survey found that 36% of grade 11 students think that there is a cure for HIV/AIDS.**
- **Data from targeted studies show that street-involved youth, youth who inject drugs and young men who have sex with men are particularly vulnerable to HIV.**
- **A wide range of prevention activities needs to be implemented to help minimize the risk of HIV transmission among youth.**

CIDPC Website:

www.phac-aspc.gc.ca/hast-vsmt/

Introduction

HIV and AIDS surveillance data indicate that youth (defined here as people aged 10 to 24 years) represents a small proportion of the total number of reported HIV and AIDS cases in Canada. At a global level, youth have been greatly affected by the HIV/AIDS epidemic as an estimated 10 million people aged 15 to 24 years are now living with HIV.[1] Half of all new infections worldwide are occurring among young people.

Within the Canadian context, the time between age 10 and 24 is a time of transition, and the individuals belonging to this age group represent a variety of subpopulations including pre-teens, teenagers and young adults. Combined, these groups make an important part of the population to target for public health education and prevention activities.

In general, youth are vulnerable to HIV infection as a result of many factors including risky sexual behaviour, substance use (including injecting drug use), and perceptions that HIV is not a threat to them. To adequately profile HIV and AIDS in the youth population, it is necessary to supplement current Canadian HIV/AIDS surveillance data with other relevant data sources such as health surveys, incidence/prevalence studies, and data on sexually transmitted infections (STI). This *Epi Update* provides the most current HIV/AIDS surveillance data for Canadian youth as well as information on those factors which put Canadian youth at risk for infection with HIV and AIDS.

AIDS Data[2]

- As of June 30, 2004, there were 19,464 AIDS cases with information about age reported to the Centre for Infectious Disease Prevention and Control

(CIDPC). Of these, 666 (3.4%) were among youth aged 10 to 24 years.

- As seen in Table 1, of the cumulative reported AIDS cases in youth aged 10 to 19 years, almost two-thirds of cases were attributed to recipients of blood or blood products. Among youth aged 20 to 24 years of age with AIDS, almost half were attributed to men who have sex with men (MSM), and 20% to heterosexual contact. Heterosexual contact includes sexual contact with a person at risk of HIV, origin from a country where HIV is endemic, and heterosexual contact as the only identified risk.

HIV Testing Data[2]

- Data received from provincial and territorial HIV testing programs do not allow for the creation of the 10 to 24 age group. The closest age group that can be constructed for youth is 15 to 29.

- As of June 30, 2004, there were 52,967 positive HIV tests with information about age reported to CIDPC. Of these, 766 (1.4%) were among youth aged 15 to 19 years, and 13,663 (26.0%) were among individuals aged 20 to 29 years.

- In 2003, females accounted for 42.5% of positive HIV test reports among those aged 15 to 29 years (217/511). This proportion has been consistent since 1999. When compared to other age groups, the proportion of positive HIV test reports attributed to females is highest among youth. Women in other age groups (such as: 30-39, 40-49 and over 50) account for approximately 20% of positive HIV tests.

- There were 15 reported HIV tests with known exposure category for 15 to 19 year olds in 2003. Of these reports, the most common risk factor categories were MSM and heterosexual contact with a person at risk (accounting for 4 reports each) followed by heterosexual contact as the only identified risk (3 reports).

- In 2003, MSM, heterosexual contact and injecting drug use accounted for 37.0%, 36.2% and 17.5% respectively of reported positive HIV tests with known exposure category among those aged 20 to 29 years.

Table 1: Number of reported AIDS cases and exposure category distribution for individuals 10 to 24 years of age, in Canada, diagnosed up to June 30, 2004

Category	Age Group			
	10-19 years		20-24 years	
Number of cases	93		573	
Percentage of all reported AIDS cases	0.48%		2.9%	
Number of cases with exposure information	87		550	
	Percentage in each exposure category*			
Exposure category	62%	Blood and blood products	51%	MSM
	13%	Heterosexual contact/endemic	21%	Heterosexual contact/endemic
	9%	MSM	11%	IDU
	9%	IDU	10%	MSM/IDU
	5%	MSM/IDU	6%	Blood and blood products
	2%	Other + perinatal	0%	Other**

MSM = Men who have sex with men, IDU = Injecting drug users

*Percentages based on the total number of cases minus those reports for which exposure category was unknown or "not identified."

**Mode of transmission is known but cannot be classified into any of the major exposure categories.

- A cumulative total of 687 positive HIV test reports had been received by June 30, 2004, for individuals less than 15 years of age. Of the 392 cases in this group with known exposure category information, perinatal transmission and exposure to infected blood or blood products accounted for 87% of cases.

HIV Incidence and Prevalence among Youth

HIV prevalence and incidence information, in conjunction with HIV/AIDS surveillance data, are more useful than surveillance data alone for depicting the current magnitude of the HIV epidemic in various population subgroups. To date, a small number of Canadian studies have examined HIV prevalence or incidence among youth, although most research has involved higher risk populations. A comprehensive inventory of Canadian HIV incidence and prevalence of studies as they relate to young adults can be found in the Surveillance and Risk Assessment Division Publication: "Inventory of HIV Incidence and Prevalence Studies in Canada".[3] The following list represents the highlights of current incidence and prevalence data among youth:

- In the Vancouver Injection Drug User Study (VIDUS), the prevalence of HIV among injecting drug users (IDU) aged 24 years and younger during the period 1996-2001 was 17%. HIV incidence among participants in this age category was reported as 2.96 for males and 5.69 for females per 100 person years (PY).[4]

- Young Aboriginal IDU in BC have been shown to have a high HIV prevalence rate. Results presented from the VIDUS study in 2003 showed that among young IDU (age 24 or under) the HIV prevalence rate for Aboriginal IDU was 39%. The prevalence rate for non-Aboriginal IDU was 11%.[5]

- Further information from the VIDUS study presented in 2003 demonstrated a high prevalence of HIV/hepatitis C (HCV) co-infection. In a sample of IDU aged 29 and under had a co-infection rate of 16%, while a further 53% were solely HCV positive and 3% were solely HIV positive.[6]

- In the Montreal Street Youth Cohort study (MSYC), participants between 14 and 25 years old have been observed since January 1995. HIV prevalence at study entry in the cohort was 1.4% (14 of 1,013 subjects). HIV incidence up to September 2000 was 0.69 per 100 person years.[7] Among MSM participating in the Montreal Street Youth study in 2000 the prevalence of HIV was 4.9% and the incidence was 1.2 per 100 PY.[7,8]

- A study focusing on MSM aged 16 to 30 (Omega cohort in Montreal) found that in 2004 MSM under 30 years of age had a slightly higher incidence rate, of 0.70 per 100 PY, compared with 0.57 per 100 PY for MSM aged 30 years and older.[9]

- In Vancouver, the Vanguard study observes young MSM (under 30 years of age) for HIV infection and risk behaviours. Results published in 2003 showed that the incidence of HIV was reported to be 1.9 per 100 PY.[10]

- The Enhanced Surveillance of Canadian Street Youth (ESCSY) is a national, multicentre, cross-sectional surveillance system of street youth aged 15 to 24 years in Canada. Of the youth tested in 2001, 1.0% were positive for HIV, 3.6% for hepatitis C virus, 11.5% for chlamydia and 14.2% for herpes simplex virus 2.[11]

Risk Behaviour Data Among Youth: Findings from the Canadian Youth, Sexual Health and HIV/AIDS Study[12]

In 2002, the Canadian Youth, Sexual Health and HIV/AIDS Study (CYSHHAS) was conducted to provide a contemporary picture of the sexual behaviour of adolescents and to increase the understanding of the factors that contribute to the sexual health of Canadian youth, with a focus on HIV/AIDS.

Administered in all provinces and territories (with the exception of Nunavut), the CYSHHAS included 11,074 students in Grades 7, 9 and 11 (approximate ages 12, 14 and 16). The CYSHHAS is the first Canada-wide study to assess adolescent sexual health since the Canada Youth and AIDS Study (CYAS) in 1989. The following information summarizes some key findings from the CYSHHAS.

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- CYSSHAS youth are sexually active.
- Almost one-quarter (23%) of grade nine boys and 19% of grade nine girls reported having had vaginal sexual intercourse. By grade 11, this figure increased to 40% of boys and 46% of girls.
- When compared to the 1989 CYAS, the proportion of students who have had sexual intercourse across all grade levels has decreased.
- Sexually active youth are using condoms; however, the proportion doing so decreases with increasing age.
- A large proportion of grade nine students (78%) reported the use of contraception that included a condom the last time they had sex. Among grade 11 students, this proportion decreased to 71% with the most apparent decline among females: 75% of grade nine females reported using a contraception measure that included condoms and 64% of grade 11 females reported using such measures.
- CYSHHAS students are generally knowledgeable about transmission of and protection from HIV/AIDS, but knowledge gains need to be made.
- Most students were able to correctly identify the means of transmission of HIV such as: sharing needles; having unprotected sexual intercourse; or having multiple sexual partners, but were less knowledgeable about the increased risk of transmission associated with men who have unprotected sex with men.
- Students had differing knowledge regarding the availability of a vaccine and cure for HIV/AIDS.
- Over two thirds of grade nine students and just under half of grade 11 students think that there is a vaccine available to prevent HIV/AIDS, and a substantial number think that HIV/AIDS can be cured if treated early.
- Approximately two thirds of grade seven students, one half of grade nine students and one third of grade 11 students do not know that there is no cure for HIV/AIDS. These findings suggest that there may be a false sense of complacency about the disease among today's youth
- There have been few HIV/AIDS knowledge gains since 1989.
- A greater proportion of students were able to correctly identify risk factors in 1989 as compared to 2002. More students surveyed as part of the 1989 survey knew that it was incorrect to assume that HIV/AIDS can be cured if treated early.
- Results from the CYSHHAS complement the HIV/AIDS surveillance data presented in this *Epi Update* as positive HIV test reports and AIDS cases cannot provide information about the behaviours that put youth at risk for HIV. Limitations of the CYSHHAS must be considered when interpreting the findings. Although this study contained a very large sample of Canadian students, it is not completely representative of Canadian youth in all jurisdictions. Caution should be used when interpreting these national level statistics. Also, the CYSHHAS represented a sample of youth who attend school across Canada, and cannot be generalized to high-risk groups of youth who are less likely to attend school.

Behaviour Among Higher Risk Populations: An Ongoing Concern

- High-risk youth (such as street-involved youth) engage in a variety of behaviours such as: sex trade involvement, low rates of condom use, and injecting drug use that puts them at increase risk for infection with HIV/AIDS. There are a number of Canadian cohorts that study not only HIV/AIDS prevalence in high-risk youth, but also the behaviours that put this population at risk for HIV/AIDS.

- In a 2001 study of young gay and bisexual men aged 15 to 30 in Vancouver, 16% of the study subjects reported selling sex for money or drugs. HIV prevalence among those who had engaged in prostitution was significantly higher than those who had not (7.3% vs. 1.1%), and incidence was higher as well (4.7 per 100 PY vs. 0.9 per 100 PY).[13]

- In an ongoing study of Montreal street youth, only 13.2% of participants reported always using condoms during vaginal intercourse, and only 32.4% reported always using condoms during anal intercourse.[14] Further risk behaviour data also indicate some alarming sexual risk behaviours: 33% had engaged in survival sex (prostitution), 51.1% had had sex with an IDU, 26.6% with an MSM, 40.6% with a prostitute and 8.2% with someone who was HIV positive.[15]

- Research reveals that levels of injecting drug use and injecting risk behaviours among youth, particularly those who are street-involved, require ongoing assessment:

- Results from the ongoing Montreal Street Youth Cohort Study showed that 42.8% of participants had a history of injecting drug use.[16] Also alarming was the incidence of the initiation of injecting drug use in street youth, estimated to be 23.6 per 100 person-years among participants between the ages of 14-17 who had not injected drugs at study entry.[17] Predictors of initiation included such risk factors as: daily alcohol consumption, survival sex in the last six months, and an episode of homelessness in the last six months.

- In another prospective cohort study of Montreal street youth aged 14 to 23 years, 31.3% were IDUs. Among these IDUs, 33.6% reported needle sharing during the last six months.[18]

- In a study of IDU in Calgary in 1998, 46% of participants who were under age 25 years as compared with 24% of those aged 25 or older reported that they had borrowed injection equipment in the previous six months.[19]

- In 2001, 18.3% of youth recruited for the Enhanced Surveillance of Canadian Street Youth reported that they had injected drugs in their lifetime.[11]

Sexually Transmitted Infections: An Indicator of Unprotected Sex

- Risk data for youth demonstrate unprotected sexual activity. The extent of this activity is further captured in rates of chlamydia and gonorrhea among those aged 15 to 24 years. Figure 1 shows that in 2002, the reported incidence of chlamydia in Canada[20] was highest among females aged 20 to 24 years (1,377/100,000 women). The reported incidence of gonorrhea (Figure 2) in Canada[20] was highest among the 15-19 year old women (101.3/100,000).

Comment

HIV/AIDS is affecting many subgroups of the Canadian population, including youth. Although the limited data available suggest that HIV prevalence is currently low among youth, sexual risk behaviour and STI data clearly indicate that the potential for HIV transmission remains significant among young Canadians.

The finding from the CYSHHAS that a substantial number of youth believe that there is a vaccine to prevent HIV/AIDS and that the disease can be cured if treated early is worrisome. Such knowledge gaps need to be addressed by public health education and prevention programs.

More incidence and prevalence information as well as trend data on HIV-related risk behaviours are needed in order to guide and evaluate prevention programs for young Canadians. Epidemiological and behavioural data for high-risk youth, such as street youth, are also needed to assess fully the risk of HIV transmission in Canada's youth population.

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HIV and AIDS among Women in Canada

At a Glance

- **In Canada, a total of 1,635 AIDS cases and 7,932 HIV cases have been reported in adult women up to June 30, 2004.**
- **Women represent an increasing proportion of those with positive HIV test reports in Canada and in 2003 accounted for one quarter of positive HIV test reports.**
- **Heterosexual contact and injecting drug use are the two major risk factors for HIV infection in women.**

CIDPC Website:

www.phac-aspc.gc.ca/hast-vsmt/

Introduction

The recent face of the HIV/AIDS epidemic in Canada has changed from what was seen in the early years, a disease which primarily affected men who have sex with men (MSM), to one that increasingly affects other groups, including injecting drug users (IDU) and heterosexuals. As a result, the number and percentage of women living with HIV/AIDS is increasing. This report updates the status of HIV and AIDS among adult and adolescent women (15 years and older) in Canada up to June 30, 2004.

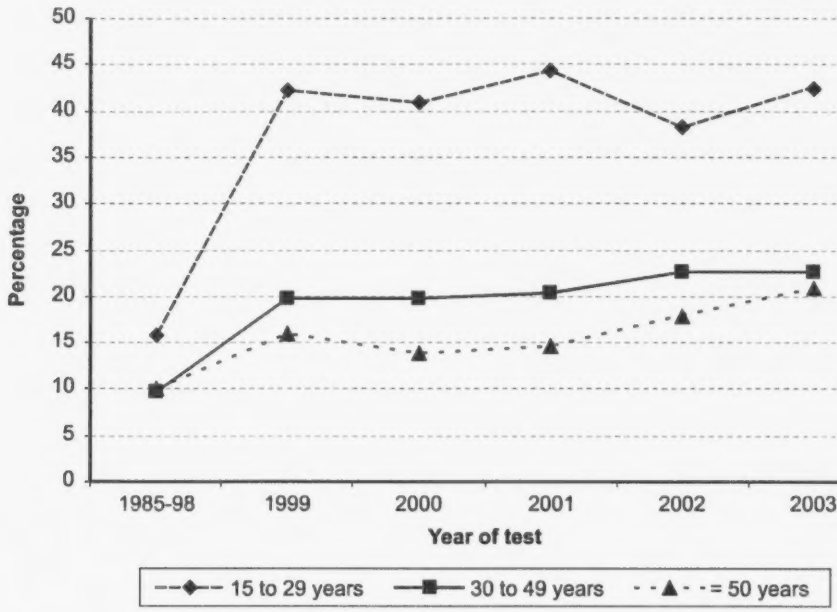
AIDS Surveillance Data

In Canada, 19,238 cumulative AIDS cases in adults were reported up to the Centre for Infectious Disease Prevention and Control (CIDPC) to June 30, 2004. Of these, 1,635 (8.5%) were among women. The proportion of all reported adult AIDS cases occurring in women (for which gender and age are known), has increased over time, from 6.4% before 1995 to 12.0% in 2000; in 2003 it again climbed to 25.2%.[1]

Of all cumulative reported AIDS cases among women up to June 30, 2004, 67.8% were attributed to heterosexual contact* 23.3% to injecting drug use and 8.6% to recipients of blood or blood products. The proportion of adult female AIDS cases attributed to IDU increased from 22.4% before 1999 to 35.5% in 1999 and has since dropped to 17.2% in 2003.[1]

* Heterosexual category includes three subcategories: sexual contact with a person who is either HIV infected or at increased risk HIV infection, origin from a country where HIV is endemic, and sex with the opposite gender as the only identified risk.

Figure 1. Proportion of positive HIV test reports among women by age group and year of test (1985-2003)



HIV Surveillance Data

AIDS data can contribute to an understanding of trends in HIV infections but only on infections acquired approximately 10 years in the past. In contrast, positive HIV test reports provide a picture of more recent infections. Data from provincial and territorial HIV testing programs indicate that a total of 7,932 positive HIV test reports with known age and gender have been reported in adult women up to June 30, 2004.[1] This number does not include those who are infected with HIV, but are unaware of their infection or choose not to be tested.

Women account for a growing proportion of positive HIV tests reports with known age and gender among adults in Canada. The proportion of females each year has risen, from 11.9% in the years between 1985 and 1997 to 24.7% of adult positive HIV test reports between 1999 and 2002. In 2003, this proportion again increased, though only slightly to 25.7%.

The proportion of women among positive HIV test reports varies considerably by their age and is highest among adolescents and young adults. In 2002, women accounted for 38.6% of positive HIV test reports among those aged 15 to 29 years, a decrease from 44.2% in 2001. Since then, the proportion has risen again, reaching 42.5% (see Figure 1).

Among women, the primary exposure categories associated with newly diagnosed HIV infection are consistently heterosexual contact and IDU (see Table 1). The proportion of positive HIV test reports in women attributed to heterosexual contact has increased over time, from 47.3% for the period 1985-1998 to 58.2% in 2002. In 2003, this proportion increased to 64.8%. The proportion attributed to IDU varied between 27% and 47.5% during this period, with the suggestion of a slight decrease over time (see Table 1). Heterosexual contact still remains the main risk factor for HIV infection in women, and while it appears that injecting drug use is responsible for a decreasing proportion of cases, it remains a significant risk factor and some studies found this risk to be greater among female than male IDU.[2] This greater degree of risk is sometimes attributable to gender

Table 1: Proportion (%) of positive HIV tests among adult females by exposure category and year of test, Canada, 1985-2003

	Exposure category (%)		
Year	Heterosexual contact*	IDU**	Blood and blood products
1985-98	47.3	39.7	7.7
1999	47.9	47.5	1.5
2000	55.6	39.3	1.7
2001	63.4	31.7	1.4
2002	58.2	37.5	1.4
2003	64.8	27.0	2.5
TOTAL	51.3	38.5	5.5

*Heterosexual category includes three subcategories: sexual contact with a person who is either HIV infected or at increased risk for HIV infection, origin from a country where HIV is endemic, and sex with the opposite gender as the only identified risk.

**IDU: Injecting drug users

differences associated with injecting practices.[3] The issue of injection drug use is discussed in further detail in the *Epi Updates* entitled "HIV and AIDS among Injecting Drug Users in Canada", on page 73, and "Risk Behaviours among Injecting Drug Users in Canada", on page 83.

HIV Prevalence and Incidence Estimates Show More Women Are Living with HIV/AIDS

The national HIV prevalence (total number living with HIV) estimates indicate that the number of women in Canada living with HIV, including those with AIDS, continues to grow. By the end of 2002, an estimated 7,700 (6,500-9,000) women were living with HIV, accounting for about 14% of the national total. This represents an increase of 13% from the 6,800 estimated at the end of 1999.[4] While some of this increase can be explained by improvements made in drug treatments leading to increases in survival, there are still unnecessarily high numbers of new infections contributing to this growth.

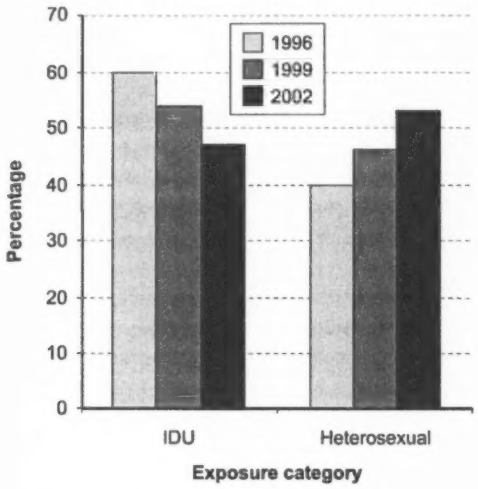
Data from positive HIV test reports do not provide the complete picture of the annual number of new HIV infections, since only a proportion of those newly infected are tested in the same year. Furthermore, not all HIV tests reported in a given year are from cases infected in that year. The estimated number of new infections (incidence) among women continues at approximately the same rate as three years ago. In 2002, women represented 23% of all new HIV infections or an estimated 600 to 1,200 out of the total of 2,800 to 5,200 new infections in Canada. With respect to exposure category distribution among newly infected women, a slightly higher proportion was attributed to the heterosexual category in 2002 compared with 1999 (53% vs. 46% respectively). The remainder of new infections among women was attributed to IDU (Figure 2).[4] There are no new data available for 2003, but these results are reflected in the data seen in Table 1.

HIV among Pregnant Women and Women of Childbearing Age

HIV testing during pregnancy is an option available to women across Canada; however, physician guidelines and/or recommendations encouraging informed decisions regarding HIV testing during pregnancy vary by province and territory. These are discussed in detail in the *Epi Update* entitled "Perinatal Transmission of HIV" on page 39.

HIV prevalence studies among pregnant women can provide an important source of

Figure 2. Estimated exposure category distribution (%) of new HIV infections among women by time period.



information on the prevalence rate of HIV in the general heterosexual population. Prenatal seroprevalence studies in Canada report an estimated national rate of HIV infection among pregnant women of 3-4/10,000 population.

Anonymous, unlinked seroprevalence studies across the country show that large metropolitan areas report higher rates of HIV infection among pregnant women (4.7 for Vancouver vs. 3.4 for the rest of B.C. in 1994;[5] 15.3 for Montreal vs. 5.2 for the province of Quebec in 1990[6]). Even provinces without large metropolitan areas have indicated significant rates (for example, 4.1/10,000 in New Brunswick for 1994-96[7]). Data from Manitoba suggest an increasing trend of HIV infection among women of childbearing age, from 0.7/10,000 in 1991 to 3.2/10,000 in 1994-95.[8] An ongoing study among pregnant Aboriginal women in B.C. reported an HIV prevalence rate of 31.3 per 10,000 pregnancies in 2000-2002 (JD Martin, Programs Medical Officer, Pacific Region, First Nations and Inuit Health Branch, Health Canada: personal communication).

The Alberta universal prenatal HIV screening program (in which all pregnant women are tested unless they opt out) reported an HIV infection rate of 3.3/10,000 pregnancies in 2000.[9] An ongoing HIV seroprevalence study of pregnant women in Ontario reported a rate of 3.7/10,000.[10] This rate is based on pregnant women who volunteered for testing (approximately 70%) whereas the rates in the other provinces (except Alberta) are based on complete samples from unlinked anonymous studies.

Risky behaviours among women, such as unsafe sex and injecting drug use, continue to put women at an increased risk of HIV. An ongoing study involving IDU in different areas across Canada found that, in 2003, about 40% of female IDU reported engaging in commercial sex work. It also showed that about 92% always used condoms with their male client partners, but almost a third never used condoms with their casual partners and condom use was infrequent with their regular partners.[11]

Comment

Women in Canada, especially IDU and women with high-risk sexual partners, are increasingly becoming infected with HIV. Even though the rate of new HIV infections among women is similar to three years ago, this number is still unacceptably high, and the proportion of positive tests in women is increasing. The prevalence estimates indicate that more women are living with HIV in 2002 compared with 1999, and this has implica-

tions for prevention and care programs. Efforts to reduce transmission of HIV among women will need to focus not only on promoting safer sexual behaviours and reducing substance abuse but also on the intersection between the two and the underlying factors that put women at an increased risk of HIV infection.

HIV testing, counselling, and care are vital to prevent and control HIV infection. More enhanced data on the trends, risk factors and geographic differences of HIV among Canadian women are needed to help target prevention and care programs.

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Acknowledgements

National level HIV and AIDS surveillance is possible as a result of all provinces and territories participating in, and setting directions for, HIV and AIDS surveillance. CIDPC acknowledges the provincial/territorial HIV/AIDS coordinators, public health units, laboratories, health care providers, and reporting physicians for sharing non-nominal, confidential data for national surveillance.

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HIV/AIDS among Older Canadians

At a Glance

- **As of June 30, 2004, 11.8% (2,293) of all reported AIDS cases have been among persons aged 50 years or older.**
- **Approximately 10% of the positive HIV test reports in Canada each year since the beginning of the epidemic have been among those aged 50 years or older. In recent years, this figure has increased to almost 12%.**
- **Sexual contact is the major risk factor for HIV infection in older Canadians. In 2003, the MSM exposure category accounted for 38.9% of AIDS cases in those over 50 years old, and heterosexual contact accounted for 36.2%.**
- **Men account for most of the reported AIDS cases and positive HIV test reports among older Canadians: 90.9% and 87.4% respectively.**

CIDPC Website:

www.phac-aspc.gc.ca/hast-vsmt/

Introduction

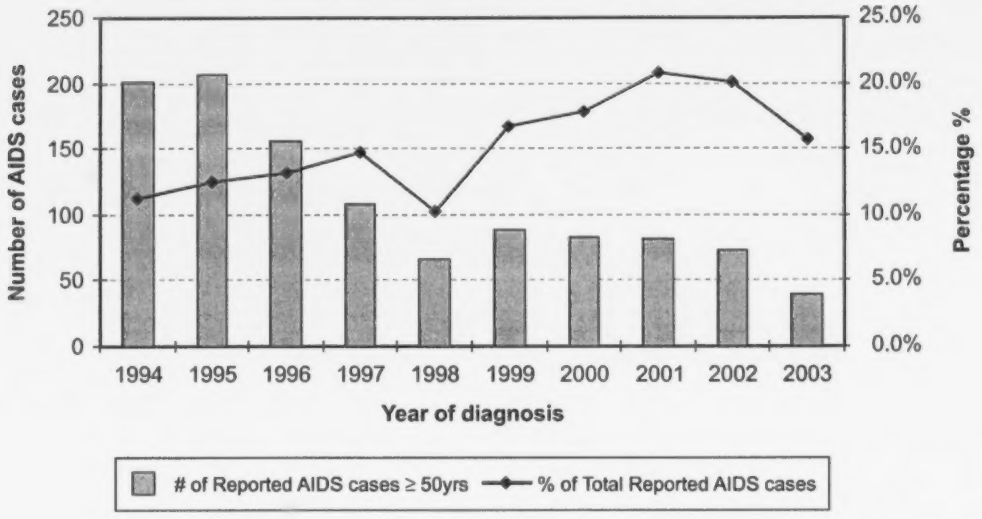
HIV/AIDS is generally believed to be a young person's disease and, consequently, little focus has been given to the issue of HIV/AIDS among older Canadians. It should be noted that the age range for "older" is subjective, and the lower age limit in the literature varies between 40 years and 55 years of age. For the purpose of this *Epi Update*, older individuals will be defined as those aged 50 years or older.

Among the over 50 population it is important to consider that the AIDS epidemic is actually comprised of two groups: those who are becoming infected at the age of 50 years or older and those who are infected with HIV at earlier ages but are now living longer before progression to AIDS. The better treatment of AIDS, through highly active antiretroviral therapy (HAART) has resulted in decreased mortality, which may contribute to higher HIV prevalence among people over the age of 50. Continuous monitoring of HIV surveillance data will be needed in this age group.

AIDS Case Report Data[1]

- As of June 30, 2004, 19,464 AIDS cases with age information have been reported to the Centre for Infectious Disease Prevention and Control (CIDPC). Of these reports, 2,293 (11.8%) have been among persons 50 years of age or older.
- Figure 1 shows that the annual number of reported AIDS cases among older adults has decreased from the mid-1990s, following a trend similar to the decrease in the number of overall AIDS cases; however, the proportion of AIDS cases attributable to those aged 50 years or more has increased over time, from 11.3% in 1994 to a high of 20.8% in 2001.

Figure 1. Number of reported AIDS cases among persons 50 years and older and percentage of all reported AIDS cases by year (1994-2003)



In 2002, this increasing trend levelled off, and even experienced a decrease to 15.7% in 2003. More years of observation will need to occur to determine if this one-year decrease develops into a sustained trend.

- A similar increasing trend has been observed in the United States[2], where the proportion of new AIDS cases attributed to individuals age 50 years has increased over time to a high of approximately 14% in 1999. Mack and Ory[2] suggest that this increase could be due to the following factors: an actual increase in new AIDS cases, better case reporting of the older population than earlier in the epidemic, or a delayed progression to AIDS because antiretroviral therapy prolongs the period from HIV infection to AIDS.

- Table 1 shows the distribution of exposure categories for all reported AIDS cases among older Canadians up to June 30, 2004. Men who have sex with men (MSM) made up the majority of reported cases among those aged 50-59 and those aged 60 years and older. Other exposure categories included exposure to blood and blood products (before 1985) and heterosexual contact.

The Changing AIDS Epidemic

Although men who have sex with men (MSM) represent the largest exposure category among cumulative AIDS diagnoses in the over 50 age group, the annual trends show a decrease in the overall proportion. Figure 2 summarizes these trends for selected exposure categories. Between 1985 and 1997, MSM represented 67.3% of all reported AIDS diagnoses among Canadians over the age of 50. By 2003, this proportion decreased to 38.9%. The combined heterosexual exposure category doubled from 18.8% between 1985 and 1997 to 36.2% in 2003. As the proportion of these two exposure categories converge, more years of surveillance data will be needed to see if this trend follows the trends observed for the entire population, where heterosexual contact has overtaken the MSM exposure category among AIDS cases.[1]

Positive HIV Test Reports[1]

While AIDS data provide information on HIV infection that occurred about 10 years in the past, HIV data provide a picture of more recent infections.

Table 1. Distribution of exposure categories among reported AIDS cases for individuals 50 years of age and older in Canada, diagnosed up to June 30, 2004

	Age Group	
	50-59 years	**≥ 60 years**
Number of cases	1,682	611
Percentage of all reported AIDS cases	8.7	3.1
Number of cases with exposure information	1,563	551
Exposure category	**Percentage in each exposure category***	
MSM	69.3	52.1
MSM/IDU	2.1	0.7
IDU	4.3	1.6
Recipient of Blood/Blood Products	5.4	17.2
Heterosexual contact**	18.5	27.9
Occupational & Other†	0.3	0.1

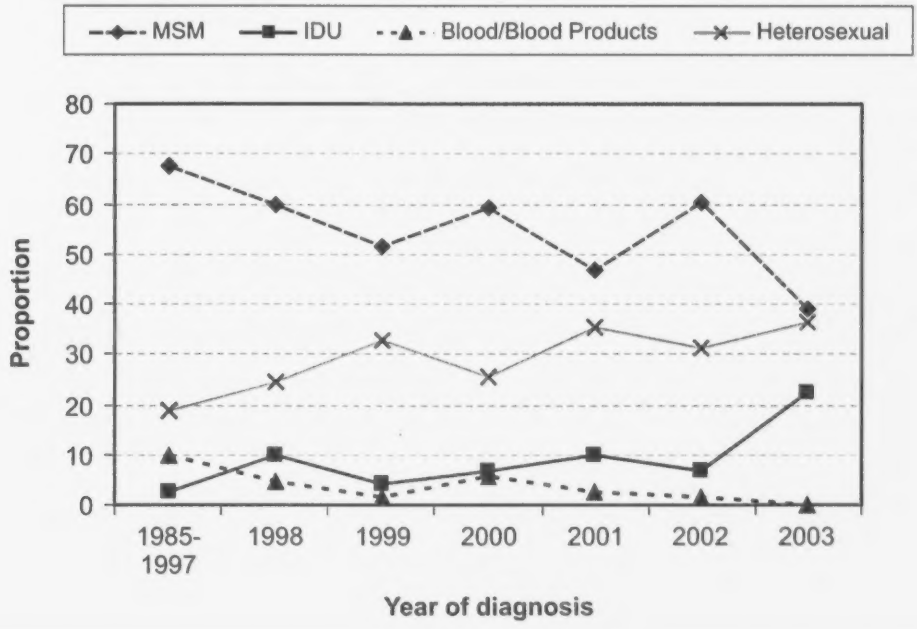
MSM = Men who have sex with men, IDU = Injecting drug users

*Percentages based on the total number of cases minus those reports for which exposure category was unknown or "not identified."

**Heterosexual contact: sexual contact with a person at risk of HIV, origin from a country where HIV is endemic, and heterosexual contact as the only identified risk.

†Mode of transmission is known but cannot be classified into any of the major exposure categories.

Figure 2. Proportion of reported AIDS diagnoses by exposure category and year of diagnosis among persons 50 years and older



Data from provincial and territorial HIV testing programs indicate that 4,433 positive HIV tests with information on age have been reported among persons 50 years and older up to June 30, 2004. The proportion of annual positive HIV test reports among those aged 50 years or older has risen from 7.5% between 1985 and 1998 to a high of 12.2% in 2001. In 2002, the trend began to level off, and by 2003, 11.9% of all positive HIV test reports could be attributed to people 50 years of age or older.

Table 2 summarizes exposure categories associated with positive HIV test reports among adults over the age of 50. In 2003, 39.5% of positive HIV test reports among those aged 50 years and older with known exposure category information were attributable to MSM. Heterosexual contact accounted for 30.9% of positive HIV test reports among those aged 50 years or older.

Table 2. Distribution of exposure categories among positive HIV test reports for individuals 50 years of age and older in Canada, reported between January 1, 2003 and December 31, 2003

	Age 50 and older
Number of Cases	293
Number of Cases with Exposure Information	152
Exposure category	**Percentage in each exposure category**
MSM	39.5
MSM/IDU	3.2
IDU	17.8
Recipients of blood/ blood products	2.6
Heterosexual contact**	30.9
Occupational and other†	3.6

MSM = Men who have sex with men, IDU = Injecting drug users

*Percentages based on the total number of cases minus those reports for which exposure category was unknown or "not identified."

**Heterosexual contact: origin in a pattern II country, sexual contact with a person at risk, or no identified risk other than heterosexual contact.

†Mode of transmission is known but cannot be classified into any of the major exposure categories.

Men account for most of the AIDS and HIV cases among older Canadians

Among the over 50 age group, men account for a majority of the AIDS and HIV cases reported to CIDPC. Of the 2,293 cumulative AIDS cases with known age and gender information, men accounted for 90.9% of cases. Among the cumulative positive HIV test reports with known age and gender information, men accounted for 87.4% of the cumulative 4,182 reports.

This gender distribution among the over 50 age group contrasts with that of other age groups where men account for just over half (57.4%) of positive HIV test reports among adults age 15 to 29 and over three-quarters (76.1%) among the 30-39 age group. The over-representation of men in the over 50 age group means that the observed trends among exposure category data (as summarized in Figure 2) are largely influenced by the male population. It also has implications for the ability to conduct detailed monitoring of exposure category information among females over the age of 50 due to sample size.

More Information Needed: Older Adults and Risk Behaviours, and Knowledge of HIV/AIDS

Healthy sexual relationships continue to be an important part of life for the majority of older adults. The availability of sexual partners and health status may be more important factors than age in determining sexual activity.[4]

- In one international study of adults aged 45 years and older (n = 1,384), 51.7% of men and 55.1% of women who reported having a sexual partner (n = 949) reported having sexual intercourse once a week or more during the previous six months.[4]

Although surveillance data for Canada suggest that sexual contact is the major risk factor for HIV infection among older adults, very little research has been conducted on risky sexual behaviour in this group; however, some information has been captured by national population surveys:

- Table 3 shows selected sexual risk behaviours among respondents aged 50 to 59 compared with all respondents in the 1996 National Population Health Survey.[5] While sexual risk behaviours were reportedly lower among older participants, they were not insubstantial.

A handful of studies suggest that some older adults may not be aware of HIV prevention methods or behaviours that put them at risk of HIV:

- In an American study of 514 women over the age of 50[6], researchers found that although 84% of women correctly identified unprotected heterosexual sex as a moderate to high-risk activity, women frequently answered questions related to the effectiveness of condoms and abstinence incorrectly. Only 13% identified condoms as very effective in the prevention of HIV, whereas 18% said they were not at all effective. Almost half (44%) of the women said that abstinence was not at all or somewhat effective.

- In a 1996 US-based study, 14.7% of the respondents age 50 to 64 did not know whether condoms were effective in preventing HIV infection compared with 6.3% of the respondents aged 18-49.[7]

- Research about risk-behaviours among older high-risk populations, such as injection drug users tends to be sparse.

- In an American study[8] comparing 1,508 older drug users (IDU and crack/cocaine smokers over the age of 50) to 1,515 younger drug users (under the age of 50), older drug users were found to be less likely to have had sex in the prior month, but those who did were as risky as their younger counterparts. Older drug users were found to be significantly less risky in their needle sharing practices that those under the age of 50.

HIV Testing Patterns

- In Canada, between 1996 and 2002, over 60% of reported AIDS diagnoses in those aged over 50 years old were made within 12 months after the first HIV positive test.[9]

- Table 4 suggests that older Canadians are less likely to have had an HIV test during their lifetime than the general adult population. Additionally, the percentage of older adults who have been tested for HIV declines with age.

Table 3. High risk sexual behaviours among Canadians aged 15-59 compared with those aged 50-59 years, 1996 National Population Health Survey[5]

Age category	Never used condoms*†‡	Did not use condom during last sexual encounter*†‡	3+ sexual partners in previous year†
15-59 yrs	8%	16%	3%
50-59 yrs	7%	8%	1%

*Use of a condom with a sexual partner of less than 12 months' duration.

†As a percentage of those in a relationship with a partner of less than 12 months' duration.

‡As a percentage of those who had had sexual intercourse in the previous year.

Table 4. Lifetime testing for HIV/AIDS, 1996 National Population Health Survey[5]

Age category	Percentage of lifetime HIV testing
All ages 18+	15
45-54 yrs	11
55-64 yrs	7
65-74 yrs	4
75+ yrs	2

Comment

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Older adults account for a substantial minority of reported HIV and AIDS cases in Canada. The distribution of age among positive HIV tests reported to the Public Health Agency of Canada shows that there is a shift towards an older age group, most marked in males.

More epidemiological and behavioural data are needed to better understand the HIV/AIDS situation among older adults to inform prevention and care programs. Population-based surveys should continue to include questions regarding condom use and number of sexual partners, as well as HIV testing behaviours, for all age groups.

Attitudes and knowledge about HIV/AIDS should be studied among those aged 50 years and older in order to assess the potential misconceptions or knowledge gaps that older adults may have with regard to HIV transmission and prevention. Given that one of the main exposure categories among older adults with reported positive HIV tests is sexual contact (MSM and the combined heterosexual category), research into the sexual risk behaviours of older Canadians needs to be supported.

As our society ages and persons with HIV/AIDS live longer as a result of improved medical treatment, it is likely that HIV/AIDS among older adults will become a broader issue. While older adults have historically been excluded from many aspects of HIV/AIDS policy and programming, the available data show that this should not be the case. The data presented here should help to overcome the ageist assumption that persons aged 50 years and older are not at risk of HIV infection.

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Perinatal Transmission of HIV

At a Glance

- **HIV testing and antiretroviral treatment can dramatically reduce perinatal HIV transmission.**
- **The HIV prevalence rate in Canada during 1994-2003 among pregnant women is approximately 3-5/10,000.**
- **The use of antiretroviral therapy by HIV-positive pregnant women is increasing.**
- **All women should have access to prenatal care that includes an offer of HIV testing.**

CIDPC Website:

www.phac-aspc.gc.ca/hast-vsmt/

Introduction

In the absence of any intervention, an estimated 15-30% of women with HIV infection will transmit the infection during pregnancy and delivery, and 10-20% through breast milk to her new-born child.[1] Transmission of HIV from an HIV-infected pregnant woman to her newborn child is known as either mother-to-child, perinatal or vertical HIV transmission. HIV infection of the child can occur during gestation (in utero), during delivery (when the fetus makes contact with maternal blood and mucosa in the birth canal) or after delivery (through breast milk). In this *Epi Update*, the status of perinatal HIV transmission in Canada and HIV testing recommendations for pregnant women are discussed.

Positive HIV Test Reports

Between 1985 and the end of June 2004, 50,979 positive HIV tests among adults have been reported to the Centre for Infectious Disease Prevention and Control (CIDPC), Public Health Agency of Canada, including 7,932 (15.6%) among women. Of the positive HIV test reports among adult women, 74.5% were in between 15 to 39 years of age.[2]

HIV Infection among Pregnant Women

HIV prevalence studies involving data from the testing of pregnant women indicate a rate for Canada of about 3-5/10,000, although rates are not available for all provinces, and data for some provinces have not been updated for 10 years. Rates for selected provinces are illustrated in Table 1.

In Ontario, a total of 105 infants (2 years old) born between 1984 and 2001 were confirmed to be HIV-infected. Almost 56% of the HIV-positive mothers reported that their risk factor for HIV infection was being from an HIV endemic country (a country in which the predominant means of HIV transmission is heterosexual contact). Another 32% reported non-

Table 1. HIV prevalence among pregnant women in Canada

Province	HIV prevalence/ 10,000 pregnant women	Year
British Columbia	3.4	1994[3]
Alberta	3.3	2000[4]
Manitoba	3.2	1994-1995[5]
Ontario*	5.0	2003[6]
Quebec	5.2	1990[7]

*among the 84% of pregnant women tested for HIV

endemic heterosexual contact, and 9% reported injecting drug use.[8]

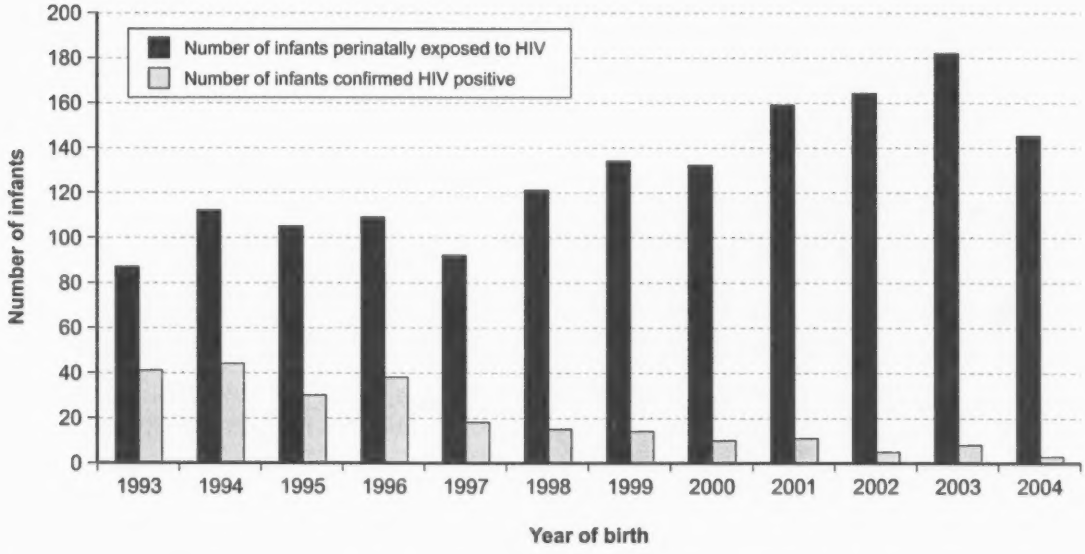
In Quebec, between July 1997 and June 2001, nearly 60% of the 209 HIV-infected pregnant women were born in an endemic country. Of these women, 73 (34.9%) were African and 52 (24.9%) were Haitian.[9]

Transmission of HIV from Mother to Infant

There have been 2,005 infants identified as perinatally exposed to HIV born between 1984 and 2004 in Canada. The number of HIV-exposed infants reported per birth-year has increased steadily from 87 infants in 1993 to 163 in 2004. The overall proportion of HIV-exposed infants whose mothers' HIV status was attributed to the exposure category of heterosexual contact was 70.6%, and 27.7% were attributed to injecting drug use.[2]

Although the number of HIV-exposed infants has increased for each birth-year, the proportion of infants confirmed to be HIV infected has decreased from 47% in 1993 to 2% in 2004 (Figure 1). Correspondingly, the proportion of HIV-positive mothers receiving antiretroviral therapy has increased steadily reaching a high of 96% in 2004.

Figure 1. Reported number of infants perinatally HIV-exposed and number confirmed HIV positive



Provincial/Territorial Prenatal HIV Screening Recommendations

In all Canadian provinces and territories, HIV testing of pregnant women remains the choice of the woman. Guidelines and/or recommendations for HIV testing of pregnant women have been developed in each province and territory to encourage informed decision-making. A summary of the various prenatal HIV testing approaches in Canada is given in Table 2.

A two-year chart review of pregnant women, which began eight months after universal prenatal counselling and vertical transmission guidelines were put into place in Ontario,

Table 2. Prenatal HIV testing approaches across Canada and year of implementation/recommendation*

Province/territory	Testing approach	Year
British Columbia	HIV testing is offered as part of routine prenatal care with informed consent and pre- and post-test counselling.	1994
Yukon	HIV testing of pregnant women is strongly recommended and testing of sex partner is also encouraged.	1994
Northwest Territories	Prenatal HIV testing was introduced in 1993 as an opt-in program, and in 1998 became integrated with routine prenatal care, although women have the opportunity to opt out and decline testing.	1993, revised 1998
Nunavut**	Same policy as Northwest Territories	1999
Alberta	HIV screening is part of routine prenatal blood tests for all women in Alberta, and HIV testing is done unless the woman declines to be tested (opt-out policy).	1998
Saskatchewan	Consent is obtained before any testing is done and appropriate pre- and post-test counselling are provided.	1999
Manitoba	It is strongly recommended that all health care professionals provide appropriate information and offer testing for HIV to all pregnant women as part of routine prenatal care. The decision not to be tested should be voluntary (i.e., opt-out option) and based on informed choice.	2002
Ontario	All pregnant women are offered an HIV test as part of prenatal care, with informed consent and appropriate pre- and post-test counselling.	1998
Quebec	All pregnant women and women contemplating pregnancy are offered an HIV test.	1997
New Brunswick	Physicians are to routinely encourage all pregnant women to be tested for HIV with appropriate pre- and post-test counselling and informed consent. Currently working to develop "opt-out" policy as the standard for HIV testing among pregnant women	1999 2004
Nova Scotia	HIV testing is offered to all pregnant women with the other prenatal tests in the first trimester. Women who decline testing in the first trimester or who are known to engage in high-risk activities are to be offered testing again during the latter stages of pregnancy.	1998
Prince Edward Island	HIV testing is recommended for all pregnant women and is offered at the first prenatal visit.	1999
Newfoundland and Labrador	HIV testing is part of routine prenatal screening and is done unless the woman declines.	1997

*As supplied by provincial/territorial HIV/AIDS data coordinators.

**Nunavut became a new territory in April 1999 after separating from the Northwest Territories.

indicated that perinatal transmission was continuing. As a result, the study authors concluded that existing guidelines were not being fully adopted and suggested that, to further decrease perinatal transmission, Ontario should include HIV testing as a routine prenatal test under an *opt-out* strategy, ensuring that women are advised that they may refuse testing.[10]

Canadian Women Can Access Prenatal HIV Screening Programs

Data from prenatal HIV screening programs can provide important information on the effectiveness of prenatal HIV screening recommendations. Data from several provinces are provided below:

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- **British Columbia:** About 55% of pregnant women in British Columbia were tested for HIV in 1995. This percentage was estimated to be up to 80% in 1999, 60% through routine prenatal testing and 20% through groups identified as at high risk (Dr. Michael Rekart, BCCDC: personal communication, March 2002).

- **Alberta:** In the first four months (September to December 1998) of their opt-out policy, 4.7% of the pregnant women who were eligible for prenatal HIV testing declined this option. In 1999, 3.3% declined,[4] and in 2000 1.5% declined.[11]

- **Manitoba:** Approximately 60% of women seeking prenatal care in Manitoba are tested for HIV. Manitoba Health is currently evaluating the introduction of the opt-out testing policy and the impact it has had on testing pregnant women for HIV (Trina Larsen, Manitoba Health: personal communication, January 2005).

- **Ontario:** HIV testing of pregnant women gradually increased from 46.9% in 1999 (41% during the pregnancy and 5.9% previously) to 84.2% during the 2003 (78.6% during the pregnancy and 5.7% previously).[6]

- **Quebec:** A recent study examined changes in medical practice regarding prenatal HIV testing in Ste-Justine Hospital, the referral centre for the province of Quebec, after the 1997 implementation of the HIV-screening strategy during pregnancy. The program consists of universal counselling and offers HIV testing to all pregnant women. The study found that the percentage of HIV tests offered to pregnant women was 61.8% in 2001.[9] Of the 58 HIV-positive pregnant women seen at this hospital in 2002, 33 were given a diagnosis of HIV before pregnancy and 20 during pregnancy.[12]

- **Newfoundland and Labrador:** Since the 1997 implementation of Newfoundland and Labrador's policy of testing pregnant women unless the woman declines, 94% of all pregnant women have been tested. There have been no cases of perinatal transmission since 1994.[13]

- **Northwest Territories:** The opt-out program in the NWT was assessed in 2001, 2002, & 2003. In 2001, one community did not screen all patients due to misinterpretation of the opt-out process. There is no evidence that prenatal women are declining HIV testing. Since 2002, all prenatal women have been screened for HIV (Wanda White, Health and Social Services: personal communication, December 2004).

Antiretroviral Treatment Can Reduce the Likelihood of Transmission of HIV from Mother to Infant during Pregnancy

HIV testing during pregnancy can provide the opportunity to offer antiretroviral treatment to the mother and infant as, for example, in the following:

- In 1994, the Pediatric AIDS Clinical Trials Group (PACTG) Protocol 076 demonstrated that a three-part course of AZT (zidovudine) could reduce the risk of mother-to-child HIV transmission by nearly 70%.[14]

- Although treatment with ZDV alone can substantially reduce the risk of mother-to-child HIV transmission, monotherapy is now considered suboptimal for the treatment of HIV infection and combination drug treatments are considered to be the standard of care.[15]

In Quebec, at Sainte-Justine Pediatric Hospital, the use of AZT reduced the likelihood of mother-to-infant HIV transmission from 28.3% transmission among mother-infant pairs who had not received any AZT to 3.8% among mother-infant pairs who had received partial or full AZT therapy.[16]

A study done from 1993 to 1999 on AZT use in British Columbia found a reduction in the HIV vertical transmission rate, from 28% in untreated women-infant pairs to 13% in partially treated pairs and 0% in completely treated pairs.[17]

In Alberta, a study examining the prevention of perinatal HIV transmission from 1998 to 1999 found that when HIV-positive mothers were treated with antiretrovirals during pregnancy and the intrapartum period, 31 of 36 babies (86%) were not HIV-infected.[18]

Canadian Prenatal HIV Screening Programs Are Valuable

Screening pregnant women for HIV clearly represents an important opportunity to prevent the transmission of HIV to infants through perinatal transmission. It has been estimated that if such programs screened 90% of pregnant women across Canada, there would be a 65% reduction in the number of HIV-infected infants (compared with no prenatal testing and assuming 24% of untreated pregnancies and 6% of treated pregnancies result in HIV-infected infants).[19]

Comment

CIDPC has estimated that about 17,000 Canadians are HIV-infected but unaware of their infection.[20] The proportion of positive HIV test reports in Canada attributed to women is on the rise. As a result, as more women become infected with HIV, the risk of perinatal transmission will increase. Given this and the fact that perinatal infections are preventable, it is important that all pregnant women, and women considering pregnancy, should have access to prenatal care that includes the offer of HIV testing as well as appropriate counselling and care.

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Acknowledgements

National level HIV and AIDS surveillance is possible as a result of all provinces and territories participating in, and setting directions for, HIV and AIDS surveillance. CIDPC acknowledges the provincial/territorial HIV/AIDS coordinators, public health units, laboratories, health care providers, and reporting physicians for sharing non-nominal, confidential data for national surveillance.

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Ethnicity Reporting for AIDS and HIV in Canada: Aboriginal and Black Communities Demand Attention

At a Glance

- **Aboriginal and Black Canadians are overrepresented among reported AIDS cases in Canada, accounting for 14.4% and 20.7% of respective AIDS cases with known ethnicity.**
- **Nearly half of all positive HIV test reports among Aboriginal (45%) and Black (49.5%) Canadians are attributable to females, yet females account for only 16.7% of reports among White Canadians.**
- **Positive HIV test reports indicate that injecting drug use and heterosexual exposure are the leading exposure categories for Aboriginal and Black Canadians respectively. Injecting drug use accounts for 59.4% of positive HIV test reports among Aboriginal peoples. Heterosexual exposure accounts for 84.5% of positive reports for Black Canadians.**

CIDPC Website:

www.phac-aspc.gc.ca/hast-vsmt/

Introduction

Documentation of ethnicity for reported AIDS cases and positive HIV test reports has become an important component of AIDS and HIV surveillance because of the unique perspective it offers on the epidemic. As with other demographic identifiers, ethnic information can contribute to the creation and evaluation of prevention and treatment programs as well as to the development of health policy.

This *Epi Update* presents a summary of ethnic information from the national AIDS and HIV surveillance system. Additional information is available in *HIV and AIDS in Canada: Surveillance Report to June 30, 2004.*[1]

8

AIDS

Improved Ethnicity Reporting Among AIDS Cases

Since 1982, when the first AIDS case was reported in Canada, a total of 87.6% (17,060/19,468) of AIDS cases reported up to June 30, 2004, have included ethnic information. During this time, the proportion of cases with this information has increased. Between 1982 and 1991, 85.6% of reported AIDS cases included information about ethnicity, increasing to 89.5% in the period between 1992 and 2001. In 2003, 83.5% (208/249) of cases included ethnic information.

Reported AIDS Cases and Ethnicity: A Balance of Changing Proportions

The total annual number of reported AIDS cases has declined over the last 10 years, from 1,831 cases in 1993 to 249 in 2003; however, the number of cases in some ethnic groups has not declined at the same rate as in others. In order to better understand trends by ethnic status, it is helpful to examine the proportion of all reported AIDS cases attributed to a particular ethnic group.

White Canadians have historically represented the largest proportion of reported AIDS cases, yet this proportion has declined over the last 10 years. The proportion of reported AIDS cases with known ethnicity attributed to the White ethnic category was highest in 1988, at 90.6%, but has declined to 53.8% in 2003. With a decrease among this group, there has been a corresponding increase in the proportion of reported AIDS cases in other ethnic groups. The increase in the proportion has been most notable among Aboriginal and Black communities since 1994 (see Figure 1). In 2001, Aboriginal and Black Canadians accounted for 3.3% and 2.2% of Canada's population respectively.[2] In 2003, they accounted for 14.4% and 20.7% of reported AIDS cases with known ethnicity. Black Canadians account for the highest proportion of reported AIDS cases among non-White groups.

8 HIV

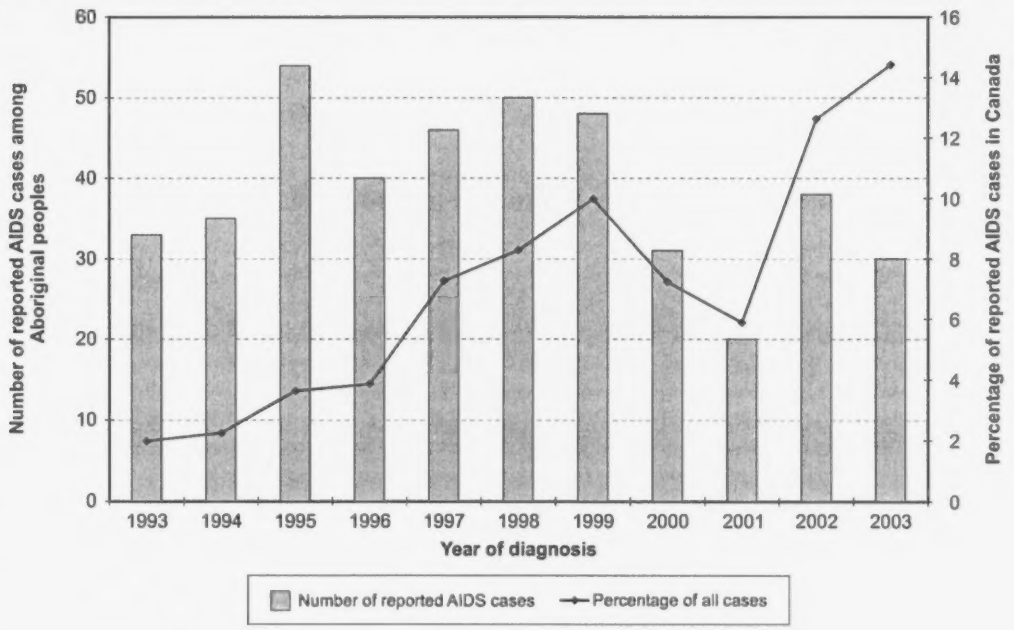
Missing Pieces: Positive HIV Tests Often Reported Without Ethnicity Information

Ethnicity reporting for positive HIV test reports is not as complete as that for reported AIDS cases because ethnicity data are available only for some provinces and territories. Reporting of HIV is more recent than AIDS, and there is still some concern regarding documentation of confidential information. As a result, the analysis of ethnicity information for HIV test reports presents a challenge.

Ethnicity data for positive HIV test reports have only been available since 1998, and consequently, comparisons are possible only for this limited period of time. Between January 1998 and June 30, 2004, a total of 29.4% (approximately one third) of positive HIV test reports have included ethnic information (4,475/15,218).

When examining HIV data, it is important to consider that HIV ethnicity data are not available for all provinces and territories. Provinces and territories that report ethnic information include British Columbia, Yukon Territory, Alberta, Northwest Territories, Nunavut, Saskatchewan, Manitoba, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador. As a result, only data from these provinces and

Figure 1. Reported AIDS Cases in the Aboriginal Community of Canada



territories are used when examining data by ethnic category, including reports for Aboriginal or Black Canadians.

Two of Canada's largest provinces, Ontario and Quebec, do not routinely collect and/or report ethnic information on their positive HIV tests. This is a limitation for conducting surveillance on ethnicity as these two provinces together account for over two-thirds of all positive HIV test reports. These two provinces also include two large urban centres, namely Toronto and Montreal, that are ethnically diverse. The omission of these provinces impedes the ability to accurately describe the epidemic among ethnic sub-groups.

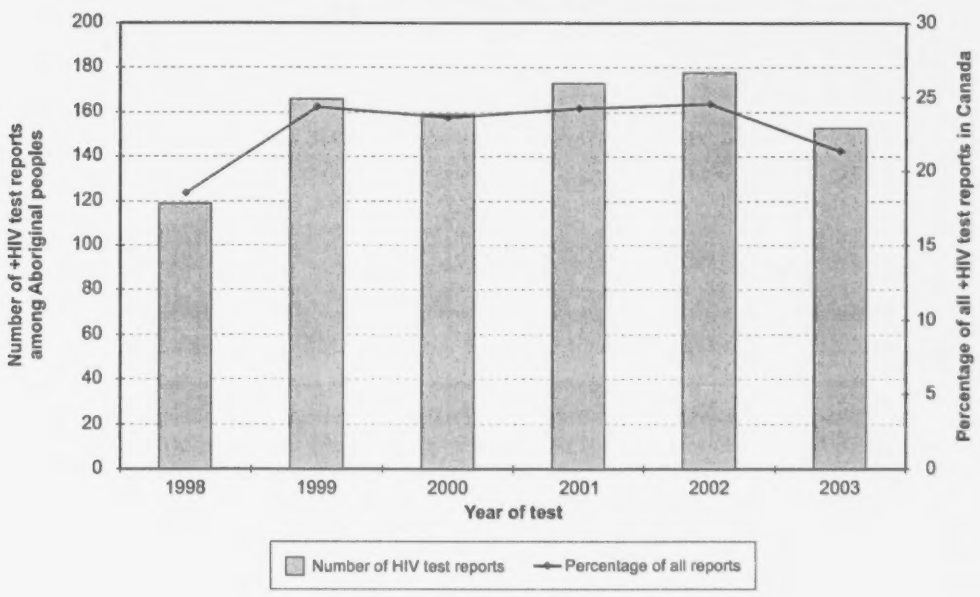
Of those provinces and territories that report information on ethnicity, a total of 90.5% of positive HIV test reports have included ethnic information between January 1998 and June 30, 2004 (4,475/4,946); therefore, please note that reports on ethnicity should not be viewed as representative of all of Canada. It must also be considered that the sources of HIV reports that include ethnicity are some areas where the Aboriginal population is large in comparison with other parts of Canada.

Aboriginal Peoples Constitute a Notable Proportion of Positive HIV Tests with Known Ethnicity

The majority of positive HIV test reports with ethnicity information are among White Canadians, as is the case with reported AIDS cases. White Canadians represented 68.0% of positive HIV test reports with known ethnicity in 1998. This figure dropped to 60.6% between 1999 and 2001 and decreased again, to 58.9%, in 2003 (421/715).

In 1998, 18.6% of positive HIV tests with known ethnicity were among Aboriginal peoples, as compared with a high of 24.6% in 2001 (Figure 2). The proportion of positive HIV test reports attributed to Aboriginal peoples in 2003 was 21.4%. These proportions are higher than the proportions attributed to Aboriginal peoples for reported AIDS cases. For example, in 2001, Aboriginal peoples accounted for 5.9% of reported AIDS cases with known ethnicity. This difference is likely due in part to HIV ethnicity information being primarily from western provinces where the Aboriginal population is greater. For additional information on HIV/AIDS among Aboriginal peoples, refer to the *Epi Update* entitled

Figure 2. Positive HIV Test Reports in the Aboriginal Community in Canada for Provinces and Territories that Report Ethnicity for HIV*



"HIV/AIDS among Aboriginal Peoples in Canada: A Continuing Concern", on page 51.[3]

Compared with other non-White groups, Aboriginal peoples account for a higher proportion of positive HIV test reports where ethnicity has been recorded (see Figure 2); however, one must remember that the two largest provinces, Ontario and Quebec, are not represented in HIV ethnicity data.

The Proportion of Positive HIV Test Reports Attributed to Black Canadians on the Rise

As data for ethnicity are incomplete for positive HIV tests at the national level, caution must be taken when making interpretations. It is important to note; however, that the proportion of reports among Black Canadians has steadily increased over the last five years. In 1998, Black Canadians represented 5.3% of positive HIV test reports with known ethnicity. This figure rose to 10.8% in 2003.

Positive HIV Tests Reflect Differences among Ethnic Groups

Of the 4,475 positive HIV test reports with ethnic information reported between January 1998 and June 30, 2004, 1,010 were among Aboriginal peoples, 371 among Black Canadians and 2,714 among White Canadians. The remaining 380 reports were attributed to other ethnic categories. Table 1 shows the distribution of gender, age and exposure category of positive HIV test reports for the three named ethnic groups. Such information may be of assistance in the design and targeting of prevention and care programs.

As shown in Table 1, reports for Aboriginal and Black Canadians are equally distributed between males and females, and there is a higher proportion at a younger age as compared with White Canadians. Injecting drug use has been a key mode of transmission among Aboriginal peoples and has accounted for 59.4% of positive HIV test reports between 1998 and June 30, 2004. People whose HIV infection was attributed to heterosexual exposure[†] represented the

Table 1. Comparison of positive HIV test reports between selected ethnic groups, 1998 to June 30, 2004

	White	Aboriginal	Black
Gender	***n* = 2,708**	***n* = 1,007**	***n* = 370**
Female	16.7%	45.0%	49.5%
Age	***n* = 2,713**	***n* = 1,009**	***n* = 371**
20-29 yrs	16.8%	26.5%	33.2%
30-39 yrs	37.3%	39.4%	42.9%
40-49 yrs	29.9%	23.5%	13.7%
Exposure category*	***n* = 2,605**	***n* = 979**	***n* = 357**
MSM	40.8%	6.9%	6.7%
IDU	32.6%	59.4%	5.9%
Heterosexual	21.4%	27.6%	84.5%

*MSM = men who have sex with men, IDU = injecting drug users

† The heterosexual exposure category includes people born in a country where HIV is endemic, people who report heterosexual contact someone who is either HIV-infected or is at increased risk of HIV infection, and people who report heterosexual contact as the only risk factor.

largest proportion of positive HIV test reports among Black Canadians (84.5%). The majority (64.1%) of those were in the subgroup persons from an HIV endemic country.

- Among White Canadians, the highest proportion of positive HIV test reports was attributed to men who have sex with men (MSM) (40.8%) and IDU (32.6%).

Limitations of Ethnicity Data from Reported HIV and AIDS Cases

There are several significant limitations regarding the accuracy of ethnicity data obtained from AIDS and HIV surveillance information. The following should be kept in mind when examining such data:

- Misclassification of ethnic status may occur at the time of HIV or AIDS diagnosis.
- For AIDS reporting, patients and health care providers are constrained by the list of ethnic categories available on the AIDS Case Report Form, which may compromise the accuracy of ethnicity reporting.
- People in certain communities may not wish to identify their ethnicity, resulting in underrepresentation.
- Not all provinces and territories routinely collect and/or report ethnicity.
- Variations in the completeness of ethnicity reporting among and within provinces may result in a systematic over or underrepresentation of specific communities.
- Reporting delay may vary by ethnicity and may therefore affect how representative ethnicity data are for recently reported HIV and AIDS cases.

Given these limitations, caution should be exercised in interpreting the AIDS and HIV ethnicity data presented. This is particularly true of positive HIV test reports, for which there is less complete ethnicity information.

Comment

Ethnicity data for AIDS continue to be well-reported in all provinces and territories. With retrospective data reaching as far back as 1982, stakeholders can continue to look at AIDS data for information on the progression of the HIV epidemic.

Despite the limitations associated with collecting and reporting ethnicity data for positive HIV test reports, the available data provide good preliminary information about the pattern of the HIV epidemic among varying ethnic groups. Completeness of the data must always be considered when interpreting current trends. Data quality issues associated with ethnicity requires continuous monitoring in order for improvements to be made. The availability of ethnicity data associated with positive HIV test reports will continue to be a relevant tool for public health enabling the design of specialized prevention and treatment programs as well as helping to evaluate the impact of such initiatives.

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HIV/AIDS among Aboriginal Peoples in Canada: A Continuing Concern

At a Glance

- **Aboriginal people in Canada are over-represented in the HIV/AIDS epidemic in Canada.**
- **Over half (51.7%) of AIDS case were attributed to injecting drug users (IDU) in 2003.**
- **HIV/AIDS has a significant impact on Aboriginal women. Females represent nearly half (45.0%) of all positive HIV test reports among Aboriginal peoples, compared with 20.0% of reports among non-Aboriginal peoples.**
- **Aboriginal peoples are being infected with HIV at a younger age than non-Aboriginal peoples. Almost a third (28.7%) represent Aboriginal youth (< 30 years) compared to 21.3% for Non-Aboriginal peoples.**

CIDPC Website:

www.phac-aspc.gc.ca/hast-vsmt/

Introduction

In Canada, Aboriginal populations are diverse, with communities (First Nations, Inuit, and Métis) that reflect variations in historical backgrounds, language and cultural traditions. Unfortunately, these communities are disproportionately affected by many social, economic and behavioural factors such as high rates of poverty, substance abuse, sexually transmitted infections, and limited access to, or use of, health care services, all of which increase their vulnerability to HIV infection.

An adequate description of the HIV/AIDS epidemic among Aboriginal peoples in Canada requires accurate and complete access to ethnicity data among AIDS cases and positive HIV test reports. Ethnicity data on AIDS cases has been complete since 1982, with 83.5% of all AIDS cases containing these data in 2003.[1] For positive HIV test reports, ethnicity data are reported for approximately one-third (29.4%) of records.[1] As such, HIV ethnicity data are not available for all provinces and territories. Provinces and territories that report ethnic information include British Columbia, Yukon Territory, Alberta, Northwest Territories, Nunavut, Saskatchewan, Manitoba, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador. As a result, only data from these provinces and territories are used when examining data on Aboriginal peoples.

Among provinces that provide ethnic information with positive HIV test reports, Aboriginal communities make up 6.0% of the population, with concentrations in the Territories[2] (Yukon, Northwest Territories, and Nunavut 22.9%, 50.5%, and 85.4% of the respective populations) and other Western provinces[2] such as Saskatchewan (13.5%) and Manitoba (13.6%). Fortunately, ethnic information on positive HIV test report data are well-reported for all of these provinces.

This report updates current information on the status of the HIV/AIDS epidemic among Aboriginal peoples in Canada. To summarize Canadian HIV and AIDS surveillance data, Aboriginal peoples are identified as First Nations, Inuit, and Métis. The category *Aboriginal Unspecified* is also used if no further details are known.

National HIV and AIDS surveillance data that appear in this document are from both a) *HIV and AIDS in Canada. Surveillance report to June 30, 2004*[3] and b) unpublished data, from the Surveillance and Risk Assessment Division (SRAD), Centre for Infectious Disease Prevention and Control (CIDPC), Public Health Agency of Canada (PHAC).

Aboriginal Peoples Make Up a Growing Percentage of HIV Reports and AIDS Cases

A steady rise has been seen in the proportion of reported AIDS cases and positive HIV test reports among Aboriginal peoples in Canada over the last number of years.

AIDS Surveillance Data

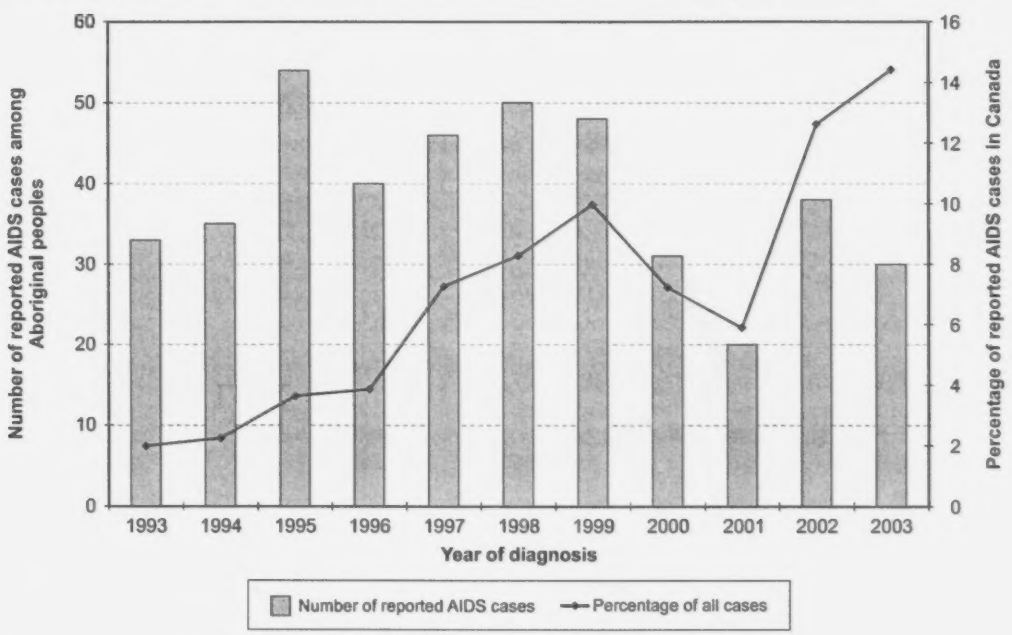
- Between 1979 and June 30, 2004, 19,468 AIDS cases were reported to CIDPC. Of these, 17,060 (87.6%) included information on ethnicity. Of these 17,060 cases, 532 were reported to be Aboriginal peoples (3.1%).

- Before 1993, out of the 8,274 reported AIDS cases with information on ethnicity, 100 cases or 1.2% were Aboriginal. This proportion steadily increased until it reached a high of 10.0% in 1999. In 2000 and 2001, the proportion decreased to 7.2% and 5.9% respectively; however, an increase was seen in 2003, when Aboriginal peoples accounted for 14.4% of the total reported AIDS cases for which ethnicity was known.

HIV Surveillance Data

- Between 1998 and the end of June 2004, there have been 15,218 positive HIV tests reported to CIDPC, 4,475 of which contained information on ethnicity (29.4%).* Of these 4,475 reports, 1,010 were for

Figure 1. Reported AIDS Cases in the Aboriginal Community of Canada



* The provinces and territories that report ethnicity with positive HIV test reports are British Columbia, Yukon Territory, Alberta, Northwest Territories, Nunavut, Saskatchewan, Manitoba, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador.

Aboriginal peoples (22.6%). As ethnicity data for positive HIV test reports have only been available since 1998, comparisons are only possible for this limited period of time.

- Figure 2 shows that since 1999, the proportion of positive HIV test reports among Aboriginal peoples has remained steady, at approximately 20%. From provinces and territories with ethnicity reporting, there were 119 positive HIV tests among Aboriginal peoples out of the 641 reported in 1998, representing 18.6% of positive HIV tests reported in that period. This proportion increased to 24.6% (178/725) of positive HIV test reports with information on ethnicity in 2002 but declined in 2003 to 21.4% (153/715).

Data from Targeted Studies

- A three year study (2000-2003) was conducted in British Columbia by the Chief's Health Committee of the First Nations Summit, in partnership with Health Canada and the Canadian Blood Services during which blood samples were taken from 5,242 pregnant Aboriginal women. A total of 15 tested positive for HIV for a prevalence rate of approximately 30 per 10,000. This is about seven times higher than would be expected in the general population since among all women in BC who had prenatal testing during 2000, 2001 and 2002, the rate was 4 per 10,000.[4]

Injecting Drug Use Continues To Be a Key Mode of Transmission in the Aboriginal Community

Injecting drug users (IDU) continue to be an important risk group in the Canadian HIV epidemic. Recent evidence supports the trends seen in surveillance data suggesting that injecting drug use is a particularly important risk factor for HIV and AIDS among Aboriginal peoples.

As Table 1 indicates, there are notable differences between Aboriginal and non-Aboriginal reported AIDS cases and positive HIV test reports with respect to exposure category.

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Figure 2. Positive HIV Test Reports in the Aboriginal Community in Canada for Provinces and Territories that Report Ethnicity for HIV*

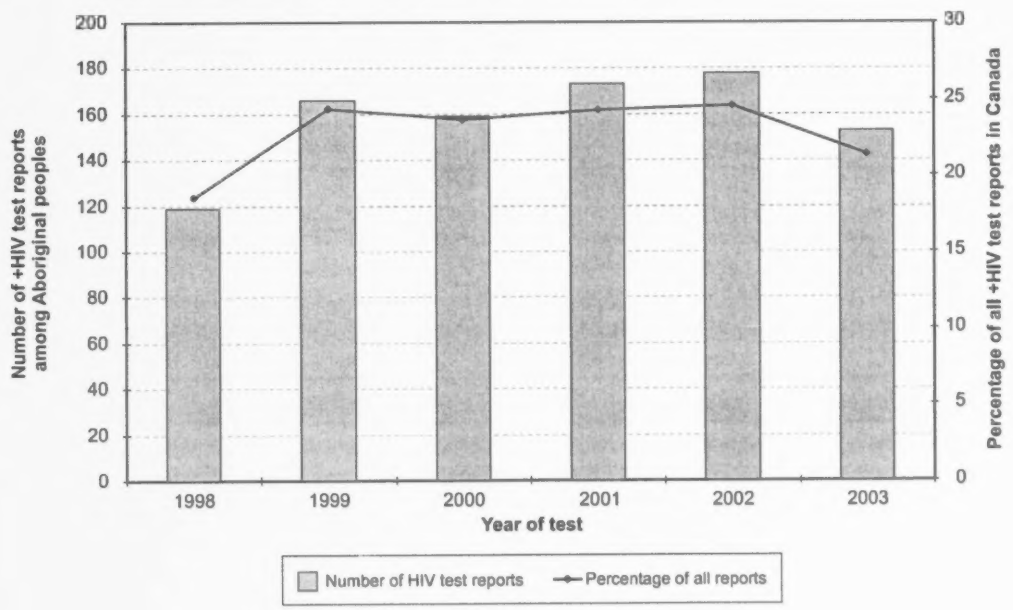


Table 1. Comparison of selected exposure categories for reported AIDS cases and positive HIV* test reports among Aboriginal and non-Aboriginal peoples

	Aboriginal	Non-Aboriginal
	n = number of cases with available information on exposure category	
AIDS 1979 – June 30, 2004	***n* = 512**	***n* = 16,053**
IDU	37.5%	6.6%
MSM	34.4%	70.2%
Heterosexual	17.2%	14.7%
HIV 1998 – June 30, 2004	***n* = 979**	***n* = 3,325**
IDU	59.4%	27.5%
MSM	6.9%	37.2%
Heterosexual	29.8%	23.5%

IDU = Injecting drug users, MSM = Men who have sex with men

* For positive HIV test reports, includes data from provinces/territories with reported ethnicity (BC, YT, AB, NT, NU, SK, MB, NB, NS, PEI, NL).

Although the proportion attributed to heterosexual exposure† is similar, Aboriginal peoples have a higher proportion of reports attributed to IDU and a smaller proportion to MSM.

AIDS Surveillance Data

Of reported AIDS cases with known exposure, the proportion of Aboriginal cases attributed to injecting drug use has dramatically increased over time, from 11.0% before 1993 to 34.9% during 1993-1997 and 52.7% during 1998-2002. In 2003, 51.7% of reported AIDS cases among Aboriginal peoples were attributed to IDU.

- Of the 532 reported AIDS cases among Aboriginal peoples between 1979 and June 30, 2004, there were 398 male cases, 133 female cases, and 1 case was a transgendered person. Figures 3a and 3b display how these cases are distributed by exposure category. As there is only one transgendered case, it is not shown.

HIV Surveillance Data

- The monitoring of positive HIV test reports between 1998 and June 2004 also shows that injecting drug use is the most common route of transmission among Aboriginal peoples. Of the Aboriginal reports with exposure category information, 59.4% were attributed to injecting drug use.

- There have been 554 males, 453 females and three cases for which gender was not reported in positive HIV test reports among Aboriginal peoples between 1998 and June 30, 2004. Figure 3c displays how reports among males are distributed by exposure category. Of female reports (summarized in Figure 3d), 65.2% were attributed to IDU and 32.7% to heterosexual exposure, proportions similar to those for reported AIDS cases.

Data from Targeted Studies

- Aboriginal people are over-represented in the IDU population and are at even higher

† The heterosexual exposure category includes people born in a country where HIV is endemic, people who report heterosexual contact with a person who is either HIV-infected or at increased risk of HIV infection, and people who report heterosexual contact as the only risk factor.

Figure 3a. Distribution of Exposure Categories among Reported AIDS Cases of Aboriginal Males (*n*=387), November 1979-June 30, 2004

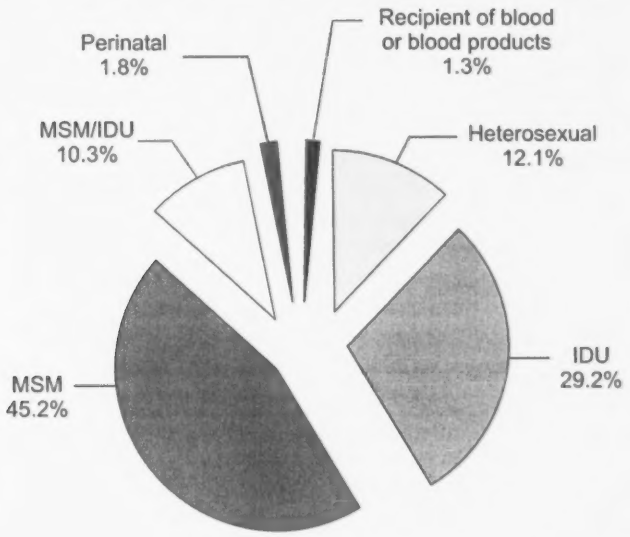
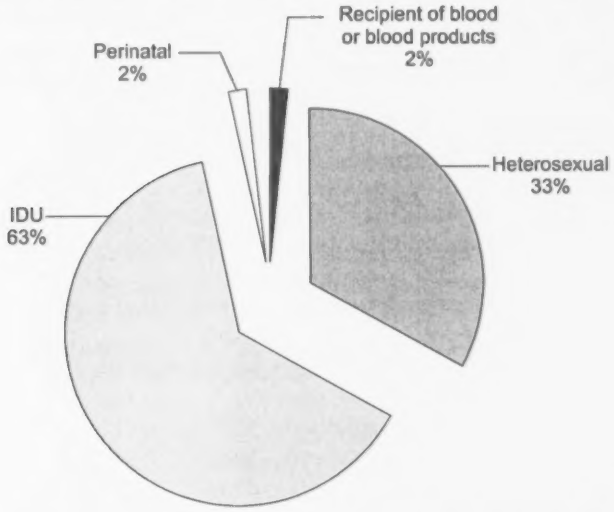


Figure 3b. Distribution of Exposure Categories among Reported AIDS Cases of Aboriginal Females (*n*=124), November 1979-June 30, 2004



risk than other members of this high-risk population.

- In the recently initiated, enhanced risk behaviour surveillance system among IDU in Regina, Sudbury, Toronto and Victoria (I-Track), 347 of the 1062 participants identified themselves as Aboriginal. Of these, 66.0% were from Regina (229/347).[5]

A 2000 study of IDU in Regina indicated that of the 255 participants, 90% self-identified as an Aboriginal person.[6]

In a study of Calgary's Needle Exchange Program, most participants were White (75%), but Aboriginal persons were the second highest ethnic group, representing 20% of total participants.[7]

Figure 3c. Distribution of Exposure Categories among Positive HIV Test Reports of Aboriginal Males (*n*=537), January 1998-June 30, 2004

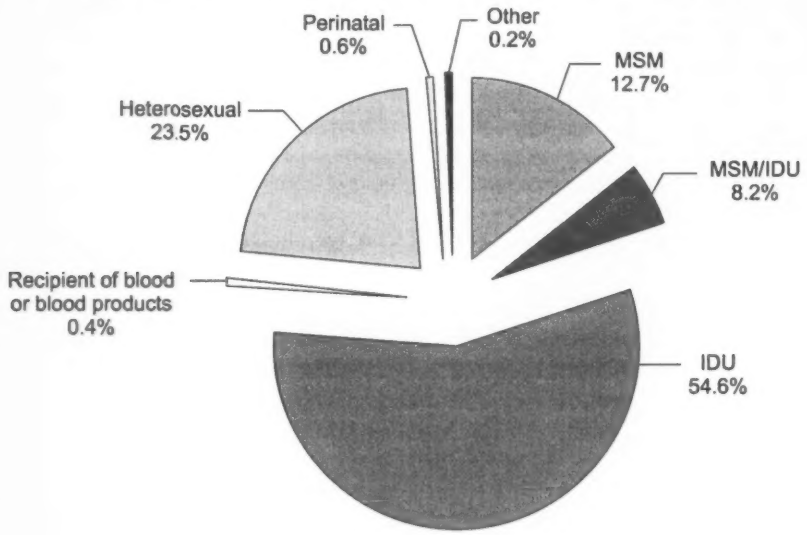
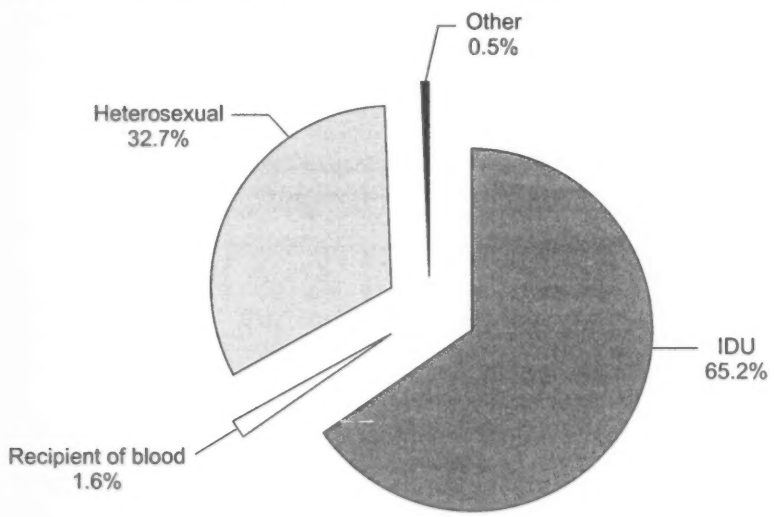


Figure 3d. Distribution of Exposure Categories among Positive HIV Test Reports of Aboriginal Females (*n*=440), January 1998-June 30, 2004



The Vancouver Injection Drug Users Study (VIDUS) is an open cohort of IDU. Of the 1,400 recruited between May 1996 and May 2000, 25% of participants were Aboriginal persons, more than half of whom were female (54% female, 46% male). In contrast, females accounted for 29% of non-Aboriginal participants.[8]

In a further analysis of the VIDUS study, investigators found that Aboriginal status was significantly associated with new HIV infection both in men and in women[9] and also in study participants 24 years of age or younger.[10]

VIDUS has reported that, as of December 2001, 19.1% of Aboriginal participants had seroconverted compared with 9.6% of

persons who identified as non-Aboriginal.[11] In a 2003 publication, investigators concluded that in Vancouver, Aboriginal IDU are becoming HIV positive at twice the rate of non-Aboriginal IDU.[12]

Of 910 MSM surveyed in Vancouver between 1995 and 2000, 106 (12%) injected drugs in the previous year. MSM/IDU were younger than MSM and more likely to be HIV-seropositive, Aboriginal, economically disadvantaged, engaged in the trade of sex for money and drugs, and to report having female partners.[13]

HIV/AIDS Has a Significant Impact on Aboriginal Women

- In contrast to HIV and AIDS cases in the non-Aboriginal population, females make up a comparatively larger part of the Aboriginal HIV epidemic. Table 2 shows the distribution of gender among positive HIV test reports and reported AIDS cases for Aboriginal and non-Aboriginal peoples. Females represent nearly half (45.0%) of all positive HIV test reports among Aboriginal peoples, compared with 20.0% of reports among non-Aboriginal peoples.

AIDS Surveillance Data

- Before 1993, females represented 11.0% of reported AIDS cases among Aboriginal peoples (11/100), yet by 2003, the proportion had increased to 40.0% (12/30).

HIV Surveillance Data

- Among Aboriginal peoples, the proportion of positive HIV test reports attributed to females peaked in 1999 at 52.7% (87/165). In 2003, females represented 44.4% of reports (68/153).

Data from Targeted Studies

Pregnant women infected with HIV are at risk of transmitting the virus to their unborn child. Data from some sites in western Canada have shown that a high proportion of HIV-infected pregnant women who deliver are Aboriginal. Of all pediatric centres across Canada where children and HIV-infected mothers were followed between 1995 and 1997, 19% (49/259) of the women seen were Aboriginal women.[14] Of 32 HIV-infected women who delivered in northern Alberta or the Northwest Territories in 1996-98, 29 (91%) were Aboriginal.[15]

Despite high numbers of Aboriginal women seen at HIV clinics and pediatric centres, there was encouraging news that during the period 1995 to 1997, pregnant Aboriginal women were as likely to be taking antiretroviral therapy (62%) as pregnant White women (66%) and pregnant Black women (63%).[16]

In a 2001 study of antiretroviral therapy in a cohort of HIV-positive pregnant women recruited at seven sites in Ontario, Manitoba and Saskatchewan, the results show that 20% of women were Aboriginal. Late use of antiretroviral therapy (in third trimester or intrapartum) was unequally distributed by ethnic status, occurring in 38% of Aboriginal, 27% of Black and 9% of White women.[17]

Table 2. Comparison of gender of reported AIDS cases and positive HIV* test reports among Aboriginal and non-Aboriginal Peoples

	Aboriginal	Non-Aboriginal
	n = number of cases with available information on gender	
AIDS (1979 – June 30, 2004)	***n* = 532**	***n* = 16,512**
Female	25.0%	8.7%
HIV (1998 – June 30, 2004)	***n* = 1,007**	***n* = 3,458**
Female	45.0%	19.5%

*For positive HIV test reports, includes data from provinces/territories with reported ethnicity (BC, YT, AB, NT, NU, SK, MB, NB, NS, PEI, NL).

Of the infants known to have contracted HIV through perinatal transmission in British Columbia between 1994 and 1999, 50% were Aboriginal.[18]

Between 2000 and 2003, an anonymous unlinked survey was conducted to measure the prevalence of HIV and HTLV-1 antibody seropositivity in Aboriginal pregnant women in British Columbia. Out of 5,242 specimens with completed tests, fifteen were determined to be HIV-positive. Among pregnant Status Indian women in British Columbia the observed prevalence of HIV was 28.6 per 10,000 pregnancies. This rate was significantly higher than rates observed in previously conducted studies among the general population of pregnant women in British Columbia (3-4 per 10,000);[19] however, the observed prevalence is lower than that among First Nations women in high risk groups for HIV infections.[20]

Aboriginal Peoples Are Being Infected with HIV at a Younger Age than Non-Aboriginal Peoples

HIV and AIDS among young people in Aboriginal communities is an increasing concern. Understanding the epidemic in this group well help to appropriately target early intervention strategies; however, it is important that caution be used when reviewing proportions by age group, as they can change considerably with the addition of only a few cases, particularly when total numbers are small, such as with youth (less than 30 years).

As indicated in Table 3, among new positive HIV test reports and reported AIDS diagnoses, Aboriginal cases are younger than non-Aboriginal cases.

AIDS Surveillance Data

Before 1993, 40.0% (40/100) of Aboriginal AIDS cases were among youth (less than 30 years), whereas in 2003 youth represented 10.0% (3/30) of cases.

9

Table 3. Comparison of age at time of diagnosis for reported AIDS cases and at time of test for positive HIV* test reports among Aboriginal and non-Aboriginal peoples

	Aboriginal	Non-Aboriginal
	n = number of cases with available information on age	
AIDS (1979 – June 30, 2004)	***n* = 532**	***n* = 16,525**
< 20 years	1.9%	1.5%
20-29 years	20.7%	15.0%
30-39 years	47.9%	43.9%
40-49 years	22.7%	28.1%
50+ years	6.8%	11.5%
HIV (1998 – June 30, 2004)	***n* = 1,009**	***n* = 2,849**
< 20 years	4.6%	1.5%
20-29 years	26.5%	19.8%
30-39 years	39.4%	38.3%
40-49 years	23.5%	26.7%
50+ years	6.0%	13.6%

*For positive HIV test reports, includes data from provinces/territories that report ethnicity (BC, YT, AB, NT, NU, SK, MB, NB, NS, PEI, NL).

MSM and IDU each accounts for approximately a third of reported AIDS cases among Aboriginal youth. MSM makes up the largest proportion, at 33.9% (40/118), followed closely by IDU at 30.5% (36/118). The data considered here is from 1979 to June 30, 2004.

HIV Surveillance Data

There has been a slight decrease in the proportion of positive HIV tests among individuals in this age group. Youth accounted for 34.5% (41/119) of positive HIV test reports among Aboriginal peoples in 1998, which contrasts with 30% (46/153) of positive test reports in 2003.

It is essential to note that IDU make up nearly 58.0% (177/305) of positive HIV test reports among youth, followed by the heterosexual exposure category at 27.1% (93/305) and MSM at 8.5% (26/305). The data considered here is from 1998 to June 30, 2004.

Data from Targeted Studies

A study of risk factors among 232 young (less than 25 years) IDU in Vancouver found that 9 of 16 (56%) of the incident cases were Aboriginal.[11]

HIV/AIDS Surveillance Data in Canada's Three Aboriginal Communities

When compared with a non-Aboriginal community, the number of positive HIV test reports and reported AIDS cases in Aboriginal communities may appear small; however, it is important to understand that these are individuals, and every new diagnosis has a significant impact on the Aboriginal community. Caution should be used when reviewing community proportions, as they can change considerably with the addition of only a few cases, particularly when total numbers are small.

AIDS Surveillance Data

According to the 2001 Census, 62% of Aboriginal Canadians are First Nations, 30% are Métis, 5% are Inuit and another 3% are from multiple communities.[2] Of 532 Aboriginal AIDS cases reported to June 30, 2004, 73.1% or 389 were First Nations, 7.3% or 39 were Métis, 4.3% or 23 were Inuit, and 15.2% or 81 were in the category Aboriginal Unspecified.

The data on reported AIDS cases in terms of IDU, females and youth in specific Aboriginal communities and in the Aboriginal Unspecified category are summarized below. Further details regarding gender and selected age and exposure category distribution are shown in Table 4.

First Nations: Reported AIDS cases among First Nations people show that 41.9% of cases can be attributed to injecting drug use (156/389). Females represent 26.5% (103/389) of cases, and youth (< 30 years) account for 22.1% (86/389) of all First Nations cases.

Métis: In the Métis community, 28.9% (11/39) of all reported AIDS cases are attributable to IDU, and few cases are female (3/39 or 7.7%). It is important to note that nearly 35.9% (14/39) of reported AIDS cases among the Métis occur in those under 30 years of age.

Inuit: The IDU exposure category represents about a third of reported AIDS cases among Inuit people, at 30.4% (7/23). A notable proportion of cases occur in females (10/23 or 43.5%), and youth (less than 30 years) represent 30.4% (7/23) of cases.

Aboriginal Unspecified: IDU account for 22.8% (8/81) of cases for which the specific Aboriginal community is unspecified. Females make up just over 21% of cases (17/81) and youth (less than 30 years) 16.1% of cases in this group (13/81).

Table 4. Gender, and selected age and exposure categories of reported AIDS cases in Aboriginal groups in Canada between 1979 and June 30, 2004

	First Nations	Inuit	Métis	Aboriginal, unspecified
	n = number of cases with available information			
Gender	***n* = 389**	***n* = 23**	***n* = 39**	***n* = 81**
Female	26.5%	43.5%	7.7%	21.0%
Age (years)	***n* = 389**	***n* = 23**	***n* = 39**	***n* = 81**
20-29 years	20.3%	30.4%	33.7%	13.6%
30-39 years	48.1%	52.2%	38.5%	50.6%
40-49 years	22.1%	13.0%	23.1%	28.4%
Exposure category	***n* = 372**	***n* = 23**	***n* = 38**	***n* = 79**
MSM	31.2%	26.1%	52.6%	43.0%
IDU	41.9%	30.4%	28.9%	22.8%
Heterosexual	15.6%	34.8%	10.5%	22.8%

Increasing Proportion of Aboriginal Peoples among Estimated HIV Prevalent and Incident Infections at the National Level

National HIV surveillance data capture only those who are tested, whose HIV infection is diagnosed and whose positive test results are reported to Health Canada. As a result, surveillance data do not describe the full scope of the epidemic; however, calculations using these data along with other sources of data are carried out to estimate the total number of people living with HIV (prevalence) and the number newly infected with HIV (incidence).

- It has been estimated that 250 to 450 Aboriginal peoples were newly infected with HIV during 2002, compared with 370 in 1999. These figures correspond to 6% to 12% of the total number of new infections in Canada in 2002, compared with 9% in 1999.[21]

- It is also estimated that 3,000 to 4,000 Aboriginal peoples were living with HIV (including AIDS) in Canada in 2002, representing 5% to 8% of HIV prevalent infections. This is higher than the 1999 estimate of 2,500 to 3,000, or about 6% of the total.[20] These proportions are noteworthy because of the distinct contrast with the proportion of the population in Canada represented by Aboriginal peoples (3.3%).[2]

- Injecting drug use is the predominant risk factor for HIV infections in Aboriginal populations. The estimated exposure category distribution of prevalent and incident infections among Aboriginal peoples in 2002 is shown in Table 5. Findings for 2002 are similar to those of 1999.[21]

- It is important to note that the *estimated* proportion of new HIV infections due to injecting drug use among Aboriginal peoples (63%) is much higher than among all Canadians (30%)[21], reinforcing the finding given earlier that injecting drug use is a key mode of HIV transmission in the Aboriginal community.

Comment

Aboriginal HIV and AIDS surveillance data are incomplete for several reasons. The primary one is the incomplete information on

Table 5. Exposure category distribution for estimated prevalent and incident HIV infections among Aboriginal peoples in Canada, 2002

Exposure category	Prevalent infections (*N* = 3,000-4,000)	Incident infections (*N* = 250-450)
IDU	57%	63%
Heterosexual contact	17%	18%
MSM	20%	12%
MSM/IDU	5%	7%

ethnicity in current surveillance data. Since 1982, 14% of all reported AIDS cases have had no information on ethnicity. Ethnicity data for positive HIV test reports have only been available since 1998. Furthermore, 69.8% of positive HIV test reports between 1998 and June 30, 2003, lack ethnicity. Other reasons include interprovincial variations in reporting ethnicity, misclassification of ethnic status and delays in reporting. Positive HIV test reports and reported AIDS cases represent only those infected individuals who came forward for testing or who received an AIDS diagnosis and are subsequently reported to Health Canada. As a result, the surveillance numbers in this report do not represent the total number of Aboriginal peoples who are infected with HIV or whose AIDS has been diagnosed.

Despite these limitations, evidence suggests that the HIV epidemic in the Aboriginal community shows no sign of abating. Injecting drug use is the most common mode of HIV transmission among Aboriginal peoples, Aboriginal women make up a large part of the HIV epidemic in their community, and Aboriginal peoples appear to be infected at a younger age than non-Aboriginals. This indicates the different characteristics of the HIV epidemic among Aboriginal peoples and emphasizes the complexity of Canada's HIV epidemic. Better data on HIV/AIDS epidemiology and HIV testing among Aboriginal peoples in Canada are needed to guide prevention and control strategies. In addition, it is vital to conduct further research to increase our understanding of the specific impact HIV has on Aboriginal peoples.

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HIV Infections among MSM in Canada

At a Glance

- **In Canada, men who have sex with men (MSM) account for 77% of cumulative reported AIDS cases among adult males.**
- **MSM account for 69.6% of positive HIV test reports among adult males since testing began in 1985.**
- **MSM were estimated to account for 40% of all new HIV infections in Canada in 2002.**

CIDPC Website:

www.phac-aspc.gc.ca/hast-vsmt/

Introduction

In Canada, the HIV/AIDS epidemic has had a tremendous impact on men who have sex with men (MSM). Even though the toll of the epidemic no longer affects MSM to the same extent that it did in the early to mid-1980s, this group still accounts for the largest number of reported HIV and AIDS diagnoses. Recent data on HIV incidence and risk behaviours suggest that MSM continue to be at risk for HIV infection and other sexually transmitted infections (STI). This report updates the current information on the status of HIV and AIDS among MSM in Canada.

AIDS Surveillance Data

- As of June 30, 2004, the Centre for Infectious Disease Prevention and Control (CIDPC) reported a cumulative total of 19,468 AIDS cases. Of the 17,585 adult male AIDS cases, 77% were attributed to MSM and an additional 4.7% were attributed to the MSM who also reported injecting drugs (MSM/IDU).[1]
- There has been a steady decrease in the proportion of adult male AIDS cases attributed to MSM that were reported to CIDPC from 1979 to 1999, from 79.3% before 1999 to 55.4% in 1999. In 2000, this proportion increased to 57.8% and remained fairly steady until 2002 and showed a drop to 46.5% in 2003.[1]
- The proportion of reported adult male AIDS cases attributed to MSM/IDU has remained relatively steady, varying between 2.2% and 6.2% during the last five years.[1]

HIV Surveillance Data

While AIDS data provide information on HIV infection that occurred about 10 years in the past, HIV data provide a picture of more recent infections.

- Positive HIV test reports sent from each province and territory are collated and synthesized at the national level by CIDPC. These reports show that before 1999, 74.2% of positive HIV test reports among adult males were attributed to MSM. This proportion then decreased to around 48% in 1999. It increased to 54.0% in 2000 and has been in the range of 48% to 54% during 2001-03.[1] A similar trend is observed in the absolute number of positive HIV test reports attributed to MSM among adult males. The increase in the number and proportion of MSM among adult male positive HIV test reports noted in 2000 was the first increase seen since the 1980s.

MSM Continue to Account for the Greatest Number of Prevalent and Incident HIV Infections

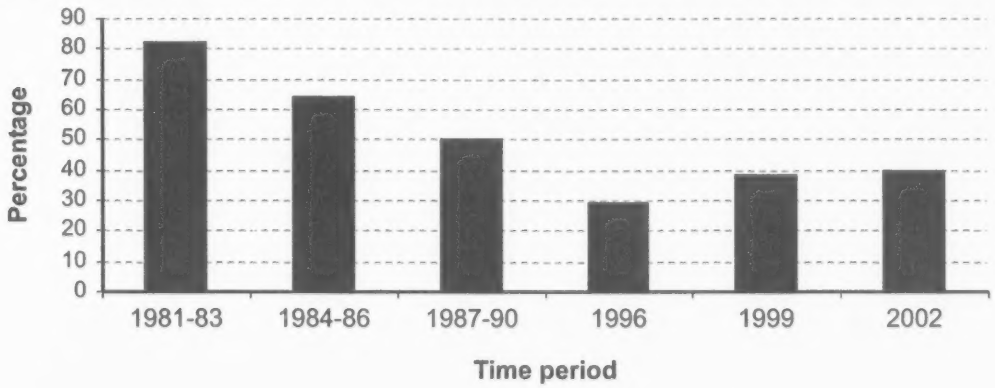
The 2002 national estimates of prevalence (number living with HIV) and incidence (number newly infected in a year) show that MSM continue to be the most affected group. At the end of 2002, an estimated 56,000 (46,000-66,000) people in Canada were living with HIV infection (including AIDS) and, of these, 58% or 32,500 infections occurred among MSM. The largest absolute increase in prevalent infections in 2002 was in the MSM exposure category, which had 2,900 more prevalent infections than in 1999 (10% relative increase). The combined exposure category of MSM and IDU (MSM-IDU) made up 4% of total prevalent infections in 2002.[2]

In 2002, MSM accounted for 40% of the estimated total of 2,800 to 5,200 new infections in Canada or approximately 1,000 to 2,000 new HIV infections. This represents a slight increase from the 38% estimated in 1999 (Figure 1).[2]

High Rates of New HIV Infections in Some Parts of Canada

- In the late 1990s, data from Ontario showed an increase in the rate of new HIV infections among MSM who were repeat testers for HIV, from 0.75 infections per 100 PY in 1996 to 1.13 per 100 PY in 1999.[3] The incidence density declined to 0.87 per 100 PY in 2000 but rose to 1.50 per 100 PY in 2002 resulting in an overall increasing trend in the 1996-2002 period.[3] Throughout the period, the incidence density was highest among MSM in Toronto (2.54/100 PY) and Ottawa (2.45/100 PY) as compared to other regions in Ontario. With the use of a new laboratory technique to identify recent infections among those with newly diagnosed HIV (STARHS assay) during 1999-2002, HIV incidence was

Figure 1. Distribution (%) of new HIV infections among MSM, by time period



measured among persons who came forward for HIV testing. Incidence decreased among MSM in Toronto, from 4.3 per 100 person years (PY) in 1999 to 2.8 per 100 person years in 2001 and has remained fairly steady to 2002. In contrast, HIV incidence among MSM in Ottawa appeared to increase, from less than 0.1 per 100 PY in 1999 to 3.5 per 100 PY in the first half of 2001 and decreased to around 1.8 per 100 PY in 2002.[4] The Ontario Laboratory Enhancement Study (LES) using STARHS assay, also revealed that the HIV incidence (per 100 PY) over 3 years period was 2.2 among MSM and 2.4 among MSM-IDU.[5]

- The results from STARHS assay in Ontario were used to model estimates of incidence and prevalence of HIV and the results revealed that MSM account for 61% of the estimated 23,563 prevalent HIV infections in Ontario and HIV prevalence among MSM in Ontario is estimated to be 14.4% (Toronto 19%, Ottawa 18%, and other regions 8%).[6] The adjusted HIV incidence density in 2003 based on detuned assay was found to be 0.85/100 PY in Ontario and was highest in Ottawa (1.41/100 PY) followed by Toronto (1.05/100 PY) and then the rest of Ontario (0.59/100 PY).[6]

- The Ontario Men's Survey was undertaken between January and June 2002 in 13 regions of the province to conduct a comprehensive cross-sectional socio-behavioural and HIV prevalence study among 5080 self-identified gay and bisexual men in Ontario.[7] Excluding men who never reported sex with another man or who did not provide a saliva sample or where the laboratory results were inconclusive, 9.4% tested positive for HIV; prevalence was 12.7% in Toronto, 4.9% in Ottawa, Southern Ontario 7.7% and 3.7% in Northern Ontario.[7]

- In Quebec, the Omega Cohort provides information on the incidence and psychosocial determinants of HIV infection among MSM living in Montreal. From October 1996 to June 2003, the overall incidence was 0.62 per 100 PY. It increased non-significantly from 0.43 to 0.83 per 100 PY between in the latest three years.[8] The Omega Cohort results showed that HIV prevalence increased with age from a rate of 0.0% in MSM under 20 years to 3.1% in those aged 40-44 years, and then decreased to 0.4% among those 45 years of age or over; however, this trend was not statistically significant.[9]

- In British Columbia, results from the Vanguard study, a prospective cohort of young gay and bisexual men in Vancouver, show that the annual rate of new HIV infections among those men who had never injected drugs increased from a range of 0.2-1.0 per 100 PY during 1996 to 1999 to 2.0 per 100 PY in 2000 and to 2.5 per 100 PY in the first nine months of 2001.[10]

- With respect to HIV prevalence, data (self-reported or test data) from surveys done directly among MSM showed a very high rate before 1990: 23% to 32% in Vancouver,[11,12] 27% to 57% in Toronto,[11,13] 20% to 25% in Montreal,[11,14] and between 10% and 20% in other regions of Canada.[10] By 1998/2000, it appeared that there was some decline in the HIV prevalence rate among MSM surveyed by similar methods: 16% in Vancouver,[15,16] and 10%-16% in Montreal.[17,18] A 2002 survey in British Columbia reported an overall prevalence of 12.9% with a higher proportion of HIV-positive men being residents of Vancouver;[19] however, a high prevalence rate is still seen among MSM who are also IDU, for example, 14% to 22% among MSM/IDU attending needle exchange programs in Quebec (1995-2000).[20,21]

Continuing Risk Behaviour among MSM

Recent data on risk behaviours suggest that MSM continue to be at considerable risk of HIV infection and other STI through engaging in unprotected receptive or insertive anal intercourse (UAI) with casual or regular partners, or practising unsafe sex (oral or anal) with a known HIV-positive partner:

- It is estimated that around 15% of Montreal's MSM are HIV-infected. Results from the Montreal Omega Cohort Study indicate that 12% of MSM practice UAI with casual partners. This could result in a significant increase in the risk of new HIV infections.[22] From 1997 to 2002, risky anal sex (RAS) increased slightly from 16% to 19%, and UAI increased slightly from 34% to 39%. The increases in risky behaviour, though slight, need to be closely monitored and better understood in order to ascertain their possible impact on HIV incidence.[8]

- In another survey in Montreal, the prevalence of reported UAI was 12% among MSM recruited in bars or saunas but was up to 21% to 24% among MSM who were HIV-positive.[17] A study on sexual risk behaviours of HIV-positive MSM in Montreal found that 15% had had unprotected insertive anal sex with an HIV-negative partner or a partner whose serostatus was unknown.[18] In another study of HIV treatment-related perceptions on sexual risk behaviours, 346 HIV-positive MSM were recruited in Montreal and 34% participants reported at least one instance of UAI in the preceding six months.[23]

- With respect to relapse to risky behaviours, available data indicate that 10% of the Montreal cohort and 26% to 30% of the Vancouver cohort who reported safe sex at baseline disclosed relapse to unprotected anal sex at follow-up six to 12 months later.[24,25]

- A 2002 survey of MSM in BC found that the majority of participants generally reported practicing safe sex (73.4%); however, those with multiple partners reported a 25% increase in UAI, from 18.8% in 2000 to 23.5% in 2002. It also showed that at least 27% of participants had had unprotected sex with a partner of unknown serostatus in the previous year.[19]

- In another study in Vancouver conducted among 131 gay men recruited in an anal dysplasia study, among those who reported anal intercourse in previous year, 55% reported UAI and 19.8% reported UAI with partner of unknown or different serostatus.[26]

- Between May 1995 and September 2001, participants aged 15 to 35 years in a cohort study of MSM in the Greater Vancouver region reported increasing unprotected insertive (relative risk: 3.5) and receptive (relative risk: 5.1) anal sex with an HIV-positive partner; this increase in UAI was associated with seroconversion.[27] In the same study during the period from September 2001 to December 2003, it was observed that majority of serconversions occurred in the small minority (15%) of those who reported sero-discordant receptive UAI.[28]

- The Polaris study, an open cohort of MSM in Ontario, examined the association between stressful relationship events (SRE) and HIV-risk behaviour, and found that those who experienced a SRE were more likely to engage in UAI with regular partner (OR=3.1, p=0.002).[29] An analysis of a sub-sample of 183 men in the Polaris study between 1998-2001 was carried out to identify risk factors for recent HIV infection; receptive anal sex without condoms (OR=4.4, p=0.01) and delayed application of condoms (OR=5.8, p=0.01) were associated with recent seroconversion.[30]

- In the Ontario Men's Survey, nearly 40% of the participants reported at least one event of unprotected anal intercourse with another man in the previous year while nearly 35% of the participants reported that they had never experienced unprotected insertive anal intercourse.[7] Of the study participants, 57.1% reported sex with at least one casual male partner and 16.0% of them reported at least one instance of unprotected receptive anal intercourse with a casual partner in the previous three months.[7] In the same study, it was observed that there were differences between men who receive money for sex and those who receive non-monetary resources in that men in the

latter group were more likely to be HIV positive, have a history of gonorrhea, and to have used cannabis, tranquillizers or cocaine in the previous year.[31]

- Data from the Vancouver cohort and the Montreal cohort were combined and analyzed, comparing the sexual behaviours of HIV positive and HIV negative gay and bisexual men aged 16 to 30 years. Results show that 56% of HIV-positive men and 40% of HIV-negative men reported having engaged in receptive UAI during the previous six months or year.[32] More recently, high-risk behaviour among MSM in both cities was associated with nitrite inhalant use and sex in public and commercial sex venues. Independent determinants of risk-taking for men in both cities were the use of poppers (Vancouver: odds ratio [OR]=2.1, Montreal: OR=2.9) and having sex in a bathhouse (Vancouver: OR=1.9, Montreal OR=1.8). In Vancouver, having sex in a bar (OR=1.8) and having at least 20 casual partners in the previous year (OR=1.7) were associated with high-risk sex. For men in Montreal, having a casual partner (OR=3.0) and having at least two regular partners in the previous year (OR=3.0) were independently associated with high-risk sexual behaviour.[33]

- The results of a cohort study of MSM aged 15 to 35 enrolled in the Vanguard Project in Vancouver showed that the proportion of MSM reporting insertive UAI with casual partners increased significantly, from 17% in 1997-98 to 22% in 2001-02, and the proportion of MSM who reported receptive UAI increased from 11% to 16% during the same period.[34] There was an increase in both receptive and insertive UAI with a regular partner, although it was not statistically significant; however, there was no significant change in HIV seroconversion rate during this period (1997-2002). This study also reported that most of the MSM who engaged in UAI reportedly did so with sero-concordant partners, although sero-concordant receptive UAI was reported by 12%.[34] In the same cohort study in Vancouver, a significant increase was observed in the proportion of MSM reporting recent use of crystal meth, ecstasy, and marijuana; the use of poppers, marijuana, hallucinogens, crystal meth, and ecstasy was found to be associated with receptive UAI with casual partners.[35] In a cohort study conducted between 1997-2002 among MSM in Vancouver, association between UAI and global and situation-specific substance use was assessed.[36] Type of drug use measure, partner type (regular vs. casual) and intercourse role (insertive vs. receptive) were found to be important determinants of association between UAI and use of specific substances and methamphetamine was specifically associated with RUAI with casual partners.[36] In the cohort recruited between May 1995 and September 2000 in Vancouver, 12% of the 910 MSM surveyed reported injecting drugs in the previous year, MSM/IDU reported more casual partners and were twice more likely to report URAI with casual partners as compared to non-IDU MSM. [37]

- During the cross-sectional data collected between 2002-03 within the Vanguard project, use of Ketamine, GHB, ecstasy, and Viagra within two hours of encounters was found to be associated with UAI with casual partners of unknown HIV status.[38]

- The recent rise in rates of reportable STI in Canada may also be used as a marker for unsafe sexual behaviour. The elimination of infectious syphilis, the least commonly reported bacterial STI in Canada, was seen as an imminent goal as recently as 1996; however, national infectious syphilis rates (preliminary) were almost four times higher in 2002 than they were in 1997 (0.4/100,000 vs. 1.5/100,000).[39] Despite limitations of surveillance data in assessing the sexual orientation of reported cases, this increase is disproportionately higher amongst males, who account for 80% of all reported cases.[39] In an analysis of a syphilis outbreak among MSM in Calgary, Alberta, in 2000-2001, it was reported that 35.7% of the MSM cases were co-infected with HIV.[40] Similarly, a review of the gonorrhea

surveillance data in Canada reveals that reported cases of gonorrhoea among men increased by 73.7% between 1997 and 2002 (compared to a 51.8% increase among females).[39] The rising rates of syphilis, reported high rate of HIV co-infection, and increase in gonorrhea rates in Canada further support the suggestion of an increase in unprotected sexual encounters among MSM.

Comment

A number of biases must be taken into account when interpreting the results noted here. HIV diagnostic data are limited to persons who present themselves for testing, and so trends in these numbers may be influenced by testing patterns or improved ability to remove duplicate tests. In addition, identifying information that accompanies HIV testing data is sometimes incomplete or inaccurate, and this may limit the usefulness of HIV incidence estimates. Results of cohort studies are limited by selection biases, loss to follow-up and problems with generalizability.

Despite these limitations, available data suggest that there was an increase nationally in new HIV infections among MSM in the late 1990s, and although this increase may not have continued, overall incidence does not appear to have decreased since then. There is also a continued presence of high-risk behaviours among MSM across the country. This high-risk behaviour among MSM is also noted elsewhere. For example, increases have been seen for HIV-associated risk behaviours and/or STDs among MSM in the USA,[41-43] Amsterdam[44] and Sydney, Australia.[45]

Several hypotheses might explain these increases in HIV-associated risk behaviours including alcohol/drug use,[33,46-48] feelings of complacency or optimism related to the success of antiretroviral therapy,[49] false reassurance upon learning an HIV-negative result, misconceptions about partner's HIV status, a lack of direct experience of the AIDS epidemic in the younger generation of gay men, a desire to escape the rigorous norms and standards required for a lifetime of safe sex,[46,50,51] and the impact of Internet chat rooms as a risky environment.[52]

The increase in new infections among MSM and the number of MSM living with HIV underscore the need for innovative prevention programs to reduce the spread of HIV and STI among the gay community. These programs should not only focus on those who are not yet infected but also those who are HIV positive. Risk behaviour measured over time and in different settings across Canada that reflect urban and rural areas, as well as diverse populations, would be useful to better characterize the epidemic among MSM and to support effective prevention and care programs.

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10

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Canada

HIV/AIDS
Epi Update
Centre for Infectious Disease Prevention and Control

HIV/AIDS among Injecting Drug Users in Canada

At a Glance

- **Injecting drug use accounts for 7.4% of cumulative adult AIDS cases and 16.7% of cumulative adult positive HIV test reports up to June 30, 2004.**
- **The 2002 national HIV estimates of prevalence and incidence indicate that the proportion of new HIV infections among IDU has decreased slightly from 34% of the total in 1999 to 30% or 800-1600 new infections in 2002.**
- **The estimated number of new HIV infections among IDU in 2002 remains unacceptably high.**
- **An enhanced surveillance system (I-Track) has been initiated at selected centres across Canada to monitor HIV-associated risk behaviours, and HIV and HCV prevalence among IDU.**

CIDPC Website:

www.phac-aspc.gc.ca/hast-vsmt/

Introduction

In the early 1980s, the Canadian HIV epidemic was concentrated among men who have sex with men (MSM). By the early to mid-1990s, there was a change toward increasing transmission among injecting drug users (IDU), and by 1999 approximately 34% of the total number of the estimated 4,190 new HIV infections that occurred in Canada that year were among IDU.[1] The 2002 national estimates indicate that the proportion of new infections among IDU has decreased slightly to 30% in 2002 (800-1,600 of a total 2,800-5,200 new infections).[2] A similar trend has occurred in the number of adult positive HIV tests reported to Centre for Infectious Disease Prevention and Control (CIDPC). Surveillance data as of June 30, 2004, indicate that in 2003, 18.4% of adult positive HIV tests reported to CIDPC were attributed to IDU, down from a peak of just over 33% in 1996 and 1997.[3] This Epi Update presents information on the status of HIV/AIDS among IDU in Canada.

AIDS Surveillance Data[3]

Injecting Drug Use Remains a Significant Exposure Category among AIDS Cases

- As of June 30, 2004, there have been 19,468 AIDS cases reported to CIDPC since the early 1980s (includes cases reported up to December 31, 2003 from Quebec; data on the number of reported AIDS cases from Quebec in the first half of 2004 were not available). Of the 18,463 cumulative adult AIDS cases with known exposure category, 7.4% (1,366) were attributed to injecting drug use and, of these, 73.3% were males. An additional 4.3% (794) were attributed to men who have sex with men and who also inject drugs (MSM/IDU).

- There was a rise in the proportion of IDU among reported adult AIDS cases from 6.1% in 1993 to a peak of 21.4% in 1998 and since then, it has remained between 15.0% and 21.1% (Figure 1).

- The proportion of adult male AIDS cases attributed to IDU steadily increased from 3.8% in 1992 to a peak of 18.7% in 2000. This proportion was in the range of 15.5% to 17.6% between 2001 and 2003.

- Females represent 26.5% of the total cumulative adult AIDS cases attributed to IDU for which exposure category and gender are reported. The proportion of adult female AIDS cases attributed to injecting drug use increased steadily from 18.0% in 1992 to a peak of 46.2% in 1998. This proportion dropped to 39.6% in 2000, and trends since then are difficult to interpret because of the small number of reported cases.

HIV Surveillance Data[3,4]

Proportion of Adult HIV Positive Test Reports among IDU Continues Gradual Decline

While AIDS data provide information on HIV infections that occurred about 10 years in the past, HIV data provide a picture of more recent infections.

- Of the 28,020 cumulative positive HIV tests in adults reported to CIDPC with exposure category information since reporting began in 1985 to June 30, 2004, 16.7% were attributable to injecting drug use (68.8% males). An additional 2.4% were attributed to MSM/IDU.

- Figure 2 shows the proportion of adult positive HIV tests attributed to injecting drug use by year of test, to the end of 2003. This proportion has gradually decreased from 28.3% in 1999 to 18.4% in 2003.

- The proportion of positive HIV test reports in adult females that could be attributed to IDU peaked at 47.5% in 1999, and showed a decline in the following years to 27.0% in 2003. The proportion in adult males attributable to IDU remained stable at approximately 23% in 1999-2001 and decreased to 15.8% in 2003.

- Of positive HIV test reports attributed to IDU reported between January 1, 2003 and December 31, 2003, that provided age and risk information, the highest proportion was among those aged 30-39 years (43.8%), followed by those aged 40-49 years (31.3%).

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Figure 1. Proportion of adult AIDS cases attributed to IDU, by year of diagnosis 1993-2003

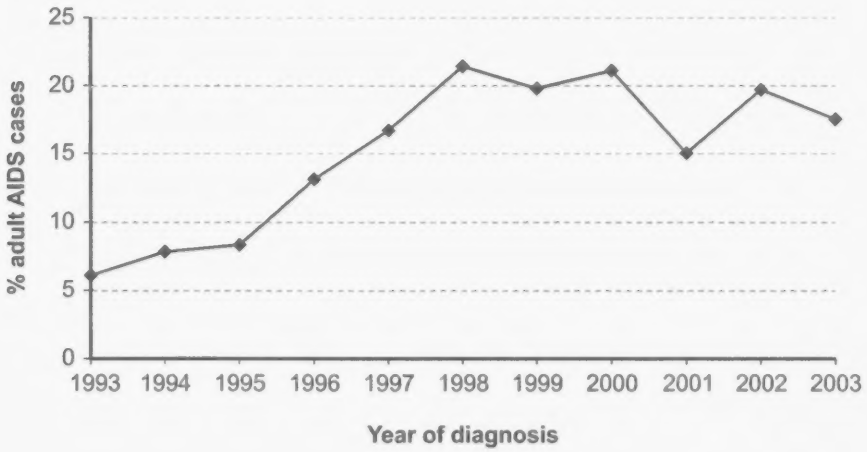
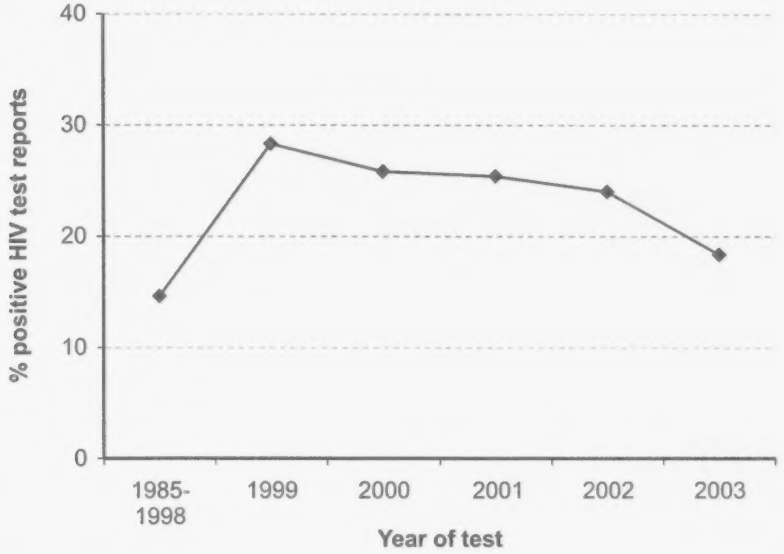


Figure 2. Proportion of adult positive HIV test reports attributed to IDU, by year of test 1985-2003



Studies Confirm HIV Prevalence Remains Unacceptably High at Sentinel Centres across Canada

In response to a need for ongoing monitoring of HIV prevalence and incidence rates as well as risk behaviours in IDU populations from across the country, an HIV and hepatitis C (HCV)-associated risk behaviour enhanced surveillance system (I-Track) has been established by Health Canada at sentinel centres across Canada through collaboration with provincial, regional and local health authorities, community-based organizations and researchers. A pilot study of the I-Track surveillance system was undertaken between October 2002 and August 2003, when a total of 1062 IDU were surveyed in Victoria, Regina, Sudbury, Toronto, and in Quebec and Ottawa through linkages made with the SurvUDI.[5] Since then additional studies have been done in Victoria, Toronto and Sudbury and are ongoing in Regina, Edmonton, Winnipeg and in Quebec and Ottawa through SurvUDI studies. Selected findings of the I-Track pilot phase are reported below, as well as those reported by other studies among IDU in Canada.

- Results from the I-Track pilot phase show that the HIV prevalence among the IDU study participants in Victoria was 16.0%,[6] lower than the 21% prevalence rate observed in a 1999 Victoria study.[7]
- In Regina, the HIV prevalence among I-Track participants was 1.2%, slightly lower than the 2.0% reported by the Regina Seroprevalence Study[8] involving a similar sample size of IDU in 2000.
- In Sudbury, an HIV prevalence of 10.1% was observed, and in Toronto the HIV prevalence of 5.1% was lower than the rate of 8.2% previously reported in a 1998 study in that city.[9]
- HIV prevalence among the SurvUDI participants where the I-Track was piloted was observed to be 19.6%.[5]
- HCV prevalence rates were high at all I-Track sentinel centres and ranged from 54.3% in Toronto to 79.3% in Victoria.[6]
- The co-infection rate at the four participating sites (Regina, Sudbury, Toronto, and Victoria), in which participants are infected with both HIV and HCV, was found to be 7.8% overall in the I-Track pilot phase.[6]

- The SurvUDI study has been ongoing since 1995 and consists of centres providing needle exchange services and other prevention programs to IDU in the province of Quebec and in Ottawa, Ontario. HIV prevalence for the overall network has increased significantly from 12.2% in 1995 to 18.6% in 2002.[10] Results show that HIV prevalence among study participants for the whole network from 1995 to June 30, 2003, was 14.7% and was higher in urban centres (15.7%) than semi-urban centres (6.0%). In 2002, HIV prevalence in Montreal, Ottawa and Quebec were found to be 23.3%, 19.7% and 15.9% respectively.[11] In a study conducted between October 2002 and January 2003 among 506 street-recruited IDU in Ottawa, HIV prevalence was observed to be 11.1%.[12]

- Results indicate that HIV incidence among repeat service attendees in the SurvUDI network decreased significantly from 5.3 per 100 person years (PY) in 1995 to 2.6 per 100 PY in 2002. Overall incidence from 1995 to June 30, 2003, was 2.9 per 100 PY in Quebec City, 4.4 per 100 PY in Montreal, 4.8 per 100 PY in Ottawa/Hull, 1.9 per 100 PY in semi-urban sites and 3.7 for the overall SurvUDI network.[11]

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- Results from the Winnipeg Injection Drug Epidemiology (WIDE) study suggest that the prevalence of HIV infection among IDU in that city increased from 2.3% in 1986-90 to 12.6% in 1998.[13]

- Research conducted by Calgary's Needle Exchange Program showed that the prevalence of HIV among IDU attending that city's NEP increased from 2.2% in 1992 to 3.3% in 1998.[14]

- In a cohort study, 203 participants were recruited into low threshold methadone programs at two sites in Ontario by December 2003, the HIV prevalence at the time of entry was found to be 7%, 84% of the HIV positive knew their serostatus, and 77% of the HIV infected were co-infected with HCV. The HCV prevalence was found to be 48%.[15]

- The POLARIS study investigated HIV incidence according to risk category among repeat testers in Ontario's diagnostic HIV-testing database during the period 1992-2000. HIV incidence among IDU decreased from 0.64 per 100 PY in 1992 to 0.14 per 100 PY in 2000.[16]

- A study examining trends in HIV incidence in Ontario based on identifying recent infections among new HIV diagnoses (using the serological testing algorithm for recent HIV seroconvertors or STARHS assay) found that HIV incidence during three year period (October 1999 to December 2002) among IDU was 0.23 per 100 PY. The incidence during the same period was 0.25 per 100 PY in Toronto, 0.71 per 100 PY in Ottawa and 0.15 per 100 PY elsewhere in Ontario.[17,18] Over time, HIV incidence among IDU in Ontario appeared to have decreased.[18] The estimated incidence of HIV in Ontario based on detuned assay in 2003 was 0.09/ 100PY in Toronto and 0.29/ 100PY in Ottawa and 0.13 / 100PY in other regions in Ontario.[19]

- Results from the Vancouver Injection Drug User Study (VIDUS) showed that HIV incidence was 1.5 per 100 PY in 2000, down from 10.3 in 1997 and 3.2 in 1999.[20] The cumulative incidence in the VIDUS cohort in 64 months between May 1996 and May 2003 was found to be 14%.[21]

- The HIV prevalence among incarcerated individuals in Quebec was found to be 2.3% among males and 8.8% among females. All the seropositive female participants in this study were IDU and the HIV prevalence among female IDU was 20.6% as compared to 7.2% among male IDU.[22]

- The HIV prevalence among incarcerated IDU in Ontario was found to be 4.1% and of the HCV positive, 7.2% were coinfected with HIV.[23]

Women, Youth and Aboriginal IDU Are Particularly at Risk of HIV Infection

Women

- Since 1996, approximately one-third to one-half of new HIV test reports among women have been attributed to injecting drug use. The latest national HIV estimates published by CIDPC for 2002 indicate that a slightly lower proportion of new HIV infections among women in 2002 were attributed to IDU than in1999 (47% vs. 54% respectively).[2]

- Findings from the VIDUS study in Vancouver show that during the period May 1996 and December 2000, HIV incidence rates among female IDU in Vancouver were about 40% higher than those of male IDU.[24]

Youth

- Results from the I-Track pilot phase indicate that 30% of participants reported initiation of injecting at the age of 16 years or younger.[6]

- High HIV incidence rates were found among young IDU when the VIDUS study in Vancouver examined rates of HIV positivity among IDU participants who were 24 years of age and younger. HIV incidence rates in this age group were 2.96 among males and 5.69 among females per 100 PY,[25] compared with an overall incidence rate of 1.5 per 100 PY in 2000.[20] This study also found that among young IDU (age 13-24 years), HIV prevalence was associated with female gender, history of sexual abuse, engaging in survival sex, injecting heroin daily, injecting speedballs daily, and having numerous lifetime sexual partners.[26]

- The HIV incidence among street youth in the Montreal Street Youth Cohort Study was 0.69 per 100 PY as of September 2000. Injecting drug use was the strongest predictor of HIV seroconversion (becoming HIV positive).[27]

- The Enhanced Surveillance of Canadian Street Youth (ESCSY) is a national, multi-centre, cross-sectional surveillance system of Canadian street youth, aged 15-24, which examines sexually transmitted infections, blood-borne pathogens and risk behaviours among street youth. Results of phases II and III of ESCSY show that approximately one-fifth of street youth surveyed had injected drugs in their lifetime.[28]

Aboriginal

- Aboriginal persons are overrepresented in IDU populations, and a larger proportion of Aboriginal HIV and AIDS cases are attributed to IDU than non-Aboriginal cases.[29] The 2002 national HIV estimates indicate that 63% of all new HIV infections among Aboriginal people in 2002 were attributable to injecting drug use, a proportion higher than the 30% attributed to IDU among new infections overall.[2]

- Results of the I-Track pilot phase showed that, overall, 31.4% of the study participants self-identified as being of Aboriginal ethnic background.[6, 30] Most of these were from Regina, where 90.2% of the study population was Aboriginal. The proportion of Aboriginal IDU among the remaining study population ranged from 3% in SurvUDI participants to 20.7% in Victoria.

- An analysis comparing the seroconversion rates of Aboriginal IDU with those of non-Aboriginal IDU recruited between 1996 and 2000 for the VIDUS study in Vancouver found that Aboriginal IDU are seroconverting at twice the rate of non-Aboriginal IDU.[31]

- The CHASE project is a prospective study where residents of the Vancouver's Downtown Eastside are recruited. In a subset of CHASE cohort which consisted of IDU, Aboriginal ethnicity was associated with HIV prevalence at baseline.[32]

International trends

A report published by UNAIDS and the World Health Organization (WHO) in December 2004 indicates that an estimated 39.4 million people in the world are living with HIV, of whom 2.2 million are children under 15 years of age. IDU is cited as one of the main modes of transmission for those living with HIV/AIDS in seven of the 10 regions of the world and include North America, North Africa and the Middle East, Western Europe, and East Asia and Pacific. In Eastern Europe and Central Asia, where the epidemic began relatively later than in other regions (early 1990s), injecting drug use is listed as the single main mode of transmission.[33] Figure 3 shows the proportion of AIDS cases attributed to IDU in selected countries since 1995. While caution should be taken when comparing and interpreting data from surveillance systems that may differ, it is interesting to note that although Canada is in the lower half of the graph, countries like Australia, Netherlands and the UK have even lower proportions of reported AIDS cases attributed to IDU. While such ecological comparisons have their limitations, this difference may be related to the availability and acceptability of programs and services that advocate harm reduction for IDU populations in these countries. More research is needed to study the effectiveness of these programs and whether similar approaches could be applicable in the Canadian setting.

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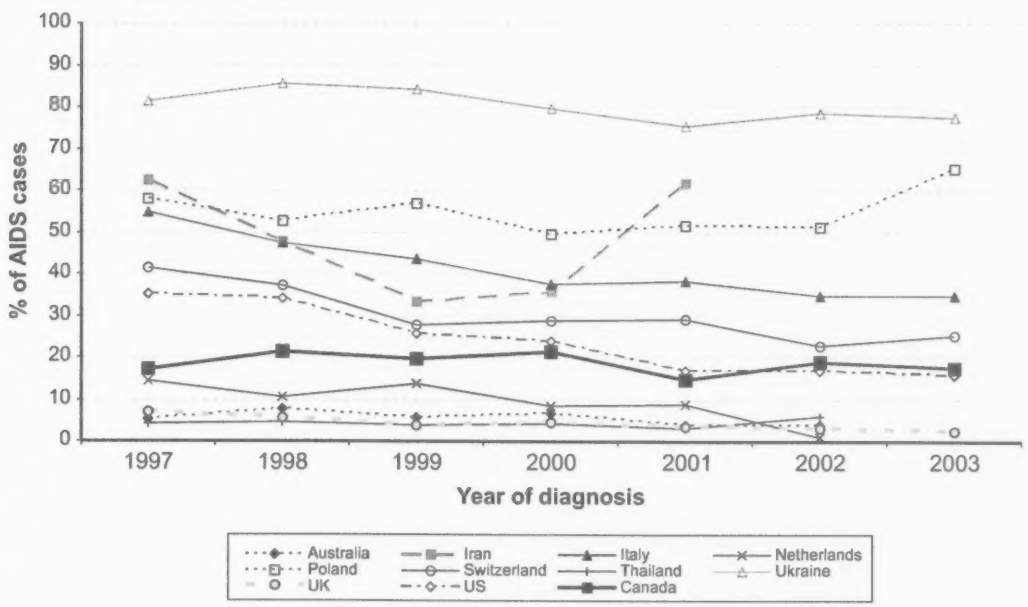
  www.med.unsw.edu.au/nchecr
- European Center for the Epidemiological Monitoring of AIDS
  www.eurohiv.org/

Figure 3. Proportion of reported AIDS cases attributed to IDU in selected countries by year of diagnosis



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  www.unaids.org/hivaidsinfo/statistics/fact_sheets/index_en.htm

Comment

A number of biases must be taken into account when interpreting the results given here. HIV diagnostic data are limited to persons who present themselves for testing, and so trends in these numbers may be influenced by testing patterns and/or improved ability to remove duplicate tests. In addition, identifying information that accompanies HIV testing data is sometimes incomplete or inaccurate, and this may limit the usefulness of HIV data. Results of cohort studies are limited by selection biases, loss to follow-up, and problems with generalizability. Studies that have a cross-sectional design have their own respective limitations.

Despite these issues, available data show that the HIV epidemic among IDU in Canada continues to be a serious problem. Although the problem is best documented in larger cities, increasingly it is now being seen outside major urban areas. The establishment of the I-Track enhanced surveillance system represents a milestone in the objective of describing changing patterns in drug injecting and sexual behaviours, HIV testing behaviours, and HIV and HCV prevalence among IDU in Canada. Results from the I-Track pilot phase suggest that the pattern of drug use and HIV prevalence differs markedly across Canada and within provinces. These findings highlight the importance of expanding the geographic coverage of the surveillance system and the need to include semi-urban centres in the future. Policy and programs to address drug use and HIV will need to be tailored according to local issues and IDU migration patterns.

The high levels of risky injecting and sexual behaviours reported by IDU in sentinel sites across Canada suggest that the potential for the transmission of HIV in these populations continues to be significant. Given the geographic mobility of IDU and their social and sexual interaction with non-users, the dual problem of injecting drug use and HIV infection is one that ultimately affects all of Canadian society.

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Canada

HIV/AIDS
Epi Update
Centre for Infectious Disease Prevention and Control

Risk Behaviours among Injecting Drug Users in Canada

At a Glance

- **Available data indicate high levels of risky injecting and sexual behaviours among IDU, suggesting that the potential for the transmission of HIV in these populations continues to be significant.**
- **Behavioural trend data are needed to reliably interpret changes in HIV incidence and prevalence among IDU, and to help evaluate prevention programs targeting this population.**
- **Marked differences in injecting drug use risk behaviour and in HIV prevalence across different cities in Canada reflect the need to increase the geographic coverage of surveillance of risky behaviours among IDU.**

CIDPC Website:

www.phac-aspc.gc.ca/hast-vsmt/

Introduction

Published estimates of national HIV prevalence and incidence indicate that 30% or 800-1,600 of the estimated 2,800-5,200 new HIV infections that occurred in Canada in 2002 were among injecting drug users (IDU).[1] Similarly, 34% of the estimated HIV infections that occurred in 1999 were among IDU.[1] A comparable trend has been observed in the number of positive HIV test reports attributed to injecting drug use reported to the Centre for Infectious Disease Prevention and Control (CIDPC). The proportion of adult positive HIV tests attributed to injecting drug use, after peaking at just over 33% in 1996 and 1997, has gradually decreased to 18.4% in 2003.[2]

Although these declining trends are encouraging, HIV among IDU remains a major concern. In the absence of a vaccine for HIV, behaviour change is the main tool for preventing HIV infection among drug injectors. Behaviour change concerns both IDU who are HIV-infected and those who are uninfected, and relates mainly to their injecting-related and sexual behaviour.

In response to a need for ongoing monitoring of HIV-associated risk behaviours in IDU populations, the Public Health Agency of Canada (PHAC), through collaboration with provincial, regional and local health authorities, community-based organizations and researchers, is establishing an HIV and Hepatitis C (HCV)-associated risk behaviour enhanced surveillance system (I-Track) at sentinel centres across Canada. A pilot study of the I-Track surveillance system was undertaken between October 2002 and August 2003, when a total of 1062 IDU were surveyed in Victoria, Regina, Sudbury, Toronto, and in Quebec and Ottawa through linkages made with the SurvUDI.[3] Since then additional studies have been done in

Victoria, Toronto and Sudbury and are ongoing in Regina, Edmonton, Winnipeg and in Quebec and Ottawa through SurvUDI studies.

This Epi Update describes the drug injecting and sexual risk behaviours that have been reported by the I-Track pilot survey as well as by other studies of IDU in Canada.

Neither a Borrower Nor a Lender Be: The Sharing of Needles and Syringes

The sharing (borrowing and lending) of needles and syringes is well established as a means of transmitting HIV infection and is a common behaviour among IDU.

- Results of the I-Track pilot survey[3,4,5] indicate that, overall, 26.7% of study participants reported injecting with used needles in the six months before the survey. Proportions ranged from 16.6% in Regina to 35.4% at selected sites in Quebec and Ottawa. IDU borrow mostly from people with whom they inject, most often close friends/family or regular sex partners. Overall, a similar proportion reported passing on or lending needles/syringes (22.5%) to other IDU for injecting purposes in the preceding six month period. The range by site was 15.8% in Regina to 30.6% in Victoria.

- A cohort study of IDU in Vancouver showed that 27.6% of the participants reported sharing needles in the previous six month period (administered during January 1999 to October 2000). Furthermore, 19.1% of the participants reported that they had shared even though they did not report having difficulty obtaining new, sterile needles.[6]

- Among the IDU recruited from shooting galleries in Quebec city, 28.9% of the participants reported injecting with used needles.[7]

- Results from the SurvUDI study show that the prevalence of needle/syringe borrowing in the previous six months dropped significantly from 43.5% in 1995 to 32.8% in 2002.[8] While these results suggest that positive trends in the reduction of sharing behaviour among IDU may be occurring in these jurisdictions, the proportion of participants who report sharing needles is still relatively high.

- Among the IDU recruited in Quebec under the OPICAN cohort, the IDU who reported using a combination of drugs were more likely to report sharing syringes as compared to those who only used opiates (88% vs 63%).[9]

The borrowing and lending of other injecting equipment (e.g. spoons, filters and water), often referred to as "indirect sharing," have also been found to be associated with HIV infection. Research indicates that indirect sharing also occurs frequently among IDU.

- Of study participants in the I-Track pilot survey,[4,5] 47.0% (range: 31.8% in Toronto to 58.8% in Sudbury) reported borrowing previously used other injecting equipment (filters, cookers, water) for injecting purposes in the preceding six months; 37.5% reported lending or passing on other injecting equipment in the six months prior to the survey.

- In a pilot study on social network of IDU in Quebec City recruited from shooting galleries, 64.4% borrowed other injecting equipment that was previously used.[7]

- In a study conducted between October 2002 and January 2003 among street-recruited IDU in Ottawa, it was observed that the IDU who reported injecting in public places were more likely to inject with used needles and a higher proportion reported male sex clients.[10]

- In a 1998 study conducted in Calgary's needle exchange program (NEP), 25% of the participants reported that they had shared injecting equipment in the six months preceding the study.[11]

- In the VIDUS cohort study of IDU in Vancouver during 1996 to 2000, 38% of men and 37% of women reported borrowing injecting equipment, and it was found to be one of the risk factors for seroconversion among men.[12]

- International studies[13-15] of IDU have identified other aspects of drug injecting, such as "front-loading" or "back-loading", which may also increase the risk of HIV transmission. These practices involve two or more IDU who use only one syringe to prepare a drug solution. The solution is then squirted into one or more additional syringes either via the front of the recipient syringe after removing its needle (front-loading) or via the back after removing the plunger (back-loading); however, the full extent of such risk behaviours among Canadian IDU is still under investigation.

Risky Business: Trading Unprotected Sex for Money and Drugs

Many IDU in Canada are involved in the commercial sex trade, and studies report inconsistent condom use with clients:

- Among IDU in the I-Track pilot survey, 41.7% of females reported having a client male sex partner in the six months before the survey. Condom use among female IDU during penetrative sex with client partners was generally high (87%) but was less so during oral sex.[5]

- Results from the SurvUDI study indicate that, between 1995 and 2003, 49.3% of females and 9.2% of males among repeat visit participants reported engaging in prostitution.[16]

- In the VIDUS study in Vancouver, 995 male IDU were recruited between 1996 and 2003, 11% reported being involved in sex trade at enrolment and 10% initiated sex trade during the follow up period and those in the sex trade had higher risky injection behaviours.[17]

- Among IDU recruited between 1988 and 1999 in a cohort study in Montreal, 18.1% of males reported that they had ever been a prostitute.[18]

- In the OPICAN cohort, 730 illicit opiate users were recruited in Vancouver, Toronto, Montreal, Edmonton, and Quebec. Heroin use was found to be associated with sex work.[19]

- In a 1998 study in Winnipeg, 71.5% of female IDU and 30.2% of male IDU reported that they had ever been paid for sex. Among females, 25.0% used condoms inconsistently with their sex trade clients. Among men with male clients, 52.0% reported inconsistent condom use.[20]

- In a 1998 study in Saskatoon, half of the female IDU population reported having been paid for sex and 19% having exchanged sex for drugs or a place to sleep in the preceding six months.[21] In the same study, condom use with casual partners was reported by 93%, but one-quarter of those did not always use a condom. Overall, 41% of the study population used condoms with regular partners.

Not Safe Enough: Sex with Regular and Casual Partners

Among IDU with regular and casual opposite sex partners, condom use is low:

- Analysis of condom use among I-Track pilot survey participants indicates that reported condom use during penetrative and oral sex in the preceding six months was less frequent with casual sex partners than with client sex partners, and less frequent still with regular sex partners. Among males, 54.6% reported inconsistent condom use during penetrative sex with their casual female sex partners in the preceding six months. Among females, 52.7% reported inconsistent condom use during penetrative sex with male casual sex partners in the preceding six months. There were no marked differences in

reported condom use between participating sites.[5]

- In the 1998 study of IDU in Winnipeg, 68.0% of women and 57.0% of men who had had regular partners in the previous year reported that they never used condoms. Of those who reported having had casual partners in this time period, approximately 30.0% of both men and women never used condoms.[20]

- Among IDU in the Regina seroprevalence study conducted in 2000, condom use with regular and casual partners was low. For example, 94% of male IDU and 92% of female IDU reported inconsistent or no condom use during vaginal sex with regular, opposite sex partners. Of those respondents who had casual partners, 58% of men and 71% of women reported inconsistent or no use of condoms with this type of partner.[22]

- In the VIDUS cohort study in Vancouver during 1996-2000, 18% of men and 20% of women reported the use of condoms with regular sex partners in the previous six months; non-use of condoms with a regular sex partner was the most significant risk factor for seroconversion among women.[12]

Male IDU and Same Sex Partners

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The proportion of male IDU reporting sexual intercourse with same sex partners varies in different cities:

- In the I-Track pilot survey, among male IDU, 6.0% reported having had male sex partners in the preceding six months.[5]

- Among male IDU in the VIDUS study who reported having had sexual intercourse in the previous six months, 7.0% reported having had only same sex partners and 6.0% reported having had partners of both sexes in this time period.[23]

- In the SurvUDI study, 14.7% of repeat-visit male subjects reported same sex partners between 1995 and 2003.[16]

- In the 1998 Calgary NEP study, 7% of men and 12% of women IDU reported having had sex with the same sex partner in the six months preceding the study.[11]

- In the Omega cohort study of MSM in Montreal, 6% of the MSM reported injecting drugs, among whom 48% had borrowed used needles and 4% had exchanged sex for drugs.[24]

Protective Behaviour Changes or Higher Risk Practices Following Positive HIV Test?

More research is needed to determine whether IDU continue to engage in high-risk behaviours or modify their behaviours after receiving a positive HIV antibody test:

- Among IDU in a Quebec cohort study conducted between 1996 and 1999, 73.1% of HIV-positive drug injectors had stopped lending needles compared with 56.0% of their HIV-negative counterparts in the six months after their HIV serostatus result; however, 8.5% of HIV-positive IDU compared with 16.0% of their non-infected peers began lending needles to HIV-positive partners in this same period. In the same study, 62.2% of HIV-positive drug injectors had stopped borrowing needles compared with 58.6% of their HIV-negative counterparts in the six months following their HIV serostatus result. Of HIV-positive IDU, 16.7% compared with 19.5% of their non-infected peers began borrowing needles from HIV-positive partners in this same period.[25]

- The VIDUS study in Vancouver reported that 35.0% of subjects who were HIV-positive reported that they had borrowed needles before learning about their serostatus. In the months after their HIV positive test, only 21.0% of these subjects reported that they continued to borrow

needles. Similarly, 37.0% of HIV-positive IDU reported needle lending before their positive HIV test, whereas only 21.0% of these subjects continued this practice after receiving their positive test results.[26]

- In a study of women in Montreal, the rate of condom use following a positive HIV test was low among IDU (19%) as compared with non-IDU of Haitian origin (30%) and non-IDU of Caucasian origin (62%).[27]

Injecting Drug Use Is a Problem Among Street Youth and Inmates

Appropriate and accessible HIV prevention programs for drug injecting, street-involved youth and inmates are clearly needed:

- Results for the I-Track pilot survey showed that the mean age of initiation of injecting drug use was 21.7 years in the study population, and 27.8% reported beginning to inject at the age of 16 years or younger (Range 19.5% in Sudbury to 36.6% in Regina).[5]

- Similarly in the VIDUS cohort, 38% of the youth initiated injection drug use at age 16 and under (Female, 46% and males 31%).[28]

- Results from the Montreal street youth study of those aged 14 to 25 years, from 1995 to 2000, show that 47.2% of the study participants had ever injected drugs. Injecting drug use was found to be the strongest indicator of HIV seroconversion.[29]

- The New Montreal Street Youth Cohort study, a prospective cohort study of street youth aged 14 to 23 years conducted between July 2001 and August 2003, found that of the street youth who were IDU, 33.6% reported injecting with a previously used needle in the last six months.[30] Among the participants aged 14-17 years recruited between January 1995 and September 2000 in Montreal Street Youth Cohort study , the incidence rate for initiation of injection drug use was found to be 23.6 per 100 PY.[31] Combined results from the two Montreal Street Youth studies cohorts revealed that 29.4% of recent injectors reported sharing needles and 34.0% reported sharing other injecting equipment, and that the sharing of needles and other injecting material showed a decline between 1995 and 2003.[32]

- Among female inmates in a Quebec prison in 1994, 38.0% reported injecting drugs before they were incarcerated, and about half of these women had shared needles. Of those who reported drug injecting before going to prison, 11.0% admitted to injecting drugs during their incarceration, and most (80.0%) shared needles.[33]

- Among male inmates in this same study, 26.0% reported that they had injected drugs before being incarcerated, and about half of these had shared needles. Of those who admitted to injecting drugs outside prison, 2.0% reported injecting drug use during their incarceration, and most (92.0%) shared needles.[33]

- In a study conducted at 7 remand facilities in Ontario, the preliminary results from 587 newly admitted inmates up to September 2003 showed that 17.3% of IDU reported lending used injection equipment after having been diagnosed HCV-positive.[34]

- In the VIDUS study among 1475 IDU in Vancouver recruited between May 1996 and May 2002, 76% reported a history of incarceration and 31% reported ever injecting in prison. Incarceration was independently associated with risky needle sharing for both HIV-positive and -negative IDU.[35]

- In the 2002 Student Drug Use Survey in New Brunswick, less than 1% of the grade 7, 9, 10 and 12 students surveyed had injected drugs in the year preceding the study period.[36]

Comment

Although several ongoing regional studies in Canada collect risk behaviour data on IDU

and a large number of one-time, cross-sectional surveys on risk-taking among IDU have been conducted, it is challenging, if not impossible, to compare levels of risk behaviours between data sets. In addition to disparities across study methodologies, different researchers have collected risk behaviour data using different questions or differently worded questions, different variable or concept definitions, different time frames for reported behaviours and different response categories. Consequently, it is difficult to use available IDU risk behaviour information to identify trends or to help evaluate the effectiveness of prevention programs and policies at more than the regional or local level.

In addition, although the national HIV estimates for 2002 show a slight decline in the number of new infections attributed to injecting drug use in that year, the relative lack of behavioural trend data hinder the reliable interpretation of this finding. The establishment of the I-Track Survey will permit the tracking of injecting and sexual risk behaviours over time, will provide important trend data that could be used to inform prevention program design and would help evaluate program effectiveness. Such behavioural data could also be used to interpret changes in HIV prevalence and incidence among IDU and would serve as an early warning system for HIV spread in this population. The high levels of risky injecting and sexual behaviours reported by IDU in sentinel sites across Canada suggest that the potential for the transmission of HIV in these populations continues to be significant. Behavioural surveillance of key subgroups of IDU, namely street-involved youth and inmates, is also needed to formulate an appropriate response to the evolving HIV epidemic among IDU in Canada.

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Oral Sex and the Risk of HIV Transmission

At a Glance

- **Unprotected oral sex has been associated with HIV infection in some studies.**
- **Poor oral health and the presence of other STI may increase the risk of HIV transmission through oral sex.**
- **The actual risk of HIV transmission through oral sex is difficult to assess since research subjects may underreport sexual activities that are of higher risk.**
- **Oral sex, particularly unprotected receptive fellatio with ejaculation, should be considered as a potential risk behaviour for HIV transmission.**

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Introduction

The risk of HIV transmission through unprotected anal and vaginal intercourse is well documented. Estimates of the probability of per-sex-act (receptive penile-anal intercourse with ejaculation) HIV transmission among homosexual men in the USA range from 0.005 to 0.03 during the asymptomatic phase of infection[1] to as high as 0.1-0.3 during primary HIV infection.[2] Analyses of data from North American and European studies of long-term heterosexual couples estimate the per-sex-act probability of HIV transmission through penile-vaginal intercourse to be approximately 0.001;[3] however, the independent risk of HIV transmission through oro-genital contact has been more difficult to study and is not as well understood.

One study calculated the per-sex-act probability of HIV transmission in a cohort of men who have sex with men (MSM) and determined that for unprotected receptive anal intercourse, the probability was 0.82% per act, for unprotected insertive anal intercourse 0.06%, and for unprotected receptive oral intercourse with ejaculation 0.04%.[4] This remains the only study available that provides a probability for oral transmission, and further study is required to corroborate these estimates.

Another study attempted to calculate the population-attributable risk percentage (PAR%) for HIV prevalence associated with fellatio. PAR% refers to the incidence of a disease (in this case, HIV) in a population that can be attributed to certain risk behaviour (in this case, fellatio). The study focused on MSM and found that the PAR% was 0.18% for MSM who had had one partner in the previous six months, 0.25% for two partners, and 0.31% for three partners.[5]

This report updates current information on oral sex and the risk of HIV transmission. Current recommendations on the use of condoms for oral intercourse are also reviewed.

Laboratory and Animal Studies: Evidence Links HIV Infection to Oral Intercourse in Humans

- An animal study found that the minimal dose of simian immunodeficiency virus (SIV) (a virus closely related to HIV-1) required to achieve infection in adult rhesus monkeys through oral exposure was 6,000 times lower than was the minimal dose needed to achieve infection after rectal exposure. The researchers concluded that, as with oral exposure of rhesus monkeys to SIV, oral exposure of humans to HIV-1 likely carries the risk of infection.[6]

- In a laboratory study designed to explore the oral transmission of HIV by seminal fluid and colostrum, normal donor samples of human milk, colostrum, seminal fluid and blood were separately combined with samples of saliva and HIV-infected white blood cells. All samples, in normal physiologic volumes, prevented saliva from inactivating the HIV-infected blood cells, leading the researchers to conclude that successful oral transmission of HIV by seminal fluid, milk and colostrum may occur.[7]

- Another study took oral tissue samples from non-infected subjects and exposed them to three types of HIV. The researchers found that normal human oral keratinocytes (NHOKs), which are produced in the mouth, can become infected with HIV and transmit the virus to adjacent leukocytes. Though certain orally produced glycolipids can inhibit HIV replication and the infectivity noted was lower than in blood plasma, the results still demonstrate the risk of potential HIV oral transmission.[8]

- A recent research study evaluated the oral transmissibility of HIV in an *ex-vivo* organ-culture system by exposing the human palatine tonsils to semen from HIV-seropositive patient and to cell-free virus. The study determined that HIV can pass through mucosal barriers to bind with epithelial cells, and that HIV infection could be established in both situations; however the probability of transmitting the infection could not be assessed.[9]

Oral Sex between Homosexual Males: Not as Safe as once Perceived

Several epidemiological studies have examined the risk of HIV infection through unprotected receptive oral intercourse (receptive fellatio):

- In a 1996-1999 study of MSM with a recent diagnosis of HIV infection, it was found that 7.8% of subjects (eight of 102) were probably infected through receptive oral sex.[10]

- In a 1986-1988 prospective study of HIV infection and AIDS among MSM in the Netherlands, four of 102 cases of seroconversion (3.9%) likely occurred as a result of receptive oral intercourse.[11]

- In a 1990-1992 study of gay men with newly diagnosed HIV infection, six of 37 patients (16.2%) who had been infected within a year before testing claimed receptive oral sex as the only possible route of their infection.[12]

Several studies have also explored the possibility of HIV transmission through unprotected insertive oro-genital intercourse (insertive fellatio) or insertive oral-anal sex (insertive anilingus):

- In a prospective study of HIV infection among MSM in the Netherlands, five of 102 seroconverters (4.9%) may have been infected through insertive oro-genital or oral-anal intercourse.[11]

- In an early cohort study of MSM, two of five cases of HIV seroconversion were attributed to insertive oro-genital sex.[13]

Additional reports or studies, while not distinguishing the type of oral sex between MSM, further suggest the possibility of HIV transmission through oral-penile/oral-anal contact:

- In the UK, 13 cases of HIV transmission through oro-genital contact had been reported to the public health authorities up to December 1998. In two of these cases, the reporting physician was not convinced that oro-genital contact was the only risk.[14]

- In a US study describing the clinical and epidemiological features of primary HIV infection, four of 46 patients reported having had only unprotected oro-genital contact during the suspected sexual encounter that led to their seroconversion.[15]

- In a study of 741 MSM in the Netherlands, oro-genital contact was identified as an independent risk for HIV acquisition, although this result was not statistically significant.[16]

- In a US study, homosexual males who were participating in a hepatitis B study were found to have a higher risk of HIV infection from both oro-genital and oro-anal contact.[17]

- In the Omega cohort in Quebec, 10 out of 629 MSM participants (1.6%) seroconverted and listed only unprotected receptive oral intercourse as the possible route of their infection.[18]

- In Australia, researchers looking at MSM and risk behaviours found that five out of 75 recently seroconverted subjects (6.7%) in the study were likely infected by oral intercourse. The authors note that it is difficult to be certain of the actual mode of transmission. The subjects had varying risk profiles: for example, one had a penile piercing that could have caused transmission, another had gingivitis and dental treatment, and another had had protected anal intercourse.[19]

Prevalence of Unprotected Oral Sex among Homosexual Males

- The Omega cohort study in Quebec examined the prevalence of unprotected oral sex among 400 MSM by the HIV serostatus of their partners. Researchers found rates for unprotected oral sex of 94% with a seronegative regular partner, 91% with a regular partner of unknown serostatus, and 88% with a seropositive regular partner. For casual partners, the rates were 92% with unknown or seronegative partners and 73% with seropositive partners.[20]

- In the Polaris study in Ontario, researchers examining the difference between recent seroconverters and HIV-negative MSM reported that 97% of the sample of seroconverters (n = 62) practised unprotected oral sex, as did 73% of HIV-negative MSM (n = 121). Further, 55% of recent seroconverters and 27% of HIV-negative MSM reported exposure to ejaculate while engaging in unprotected oral sex.[21]

In the Ontario Men's Survey, researchers studied sexual behaviours among MSM across the province. Risky oral intercourse was common among the participants. Condom use during oral sex with regular partners was low, with participants having used condoms 18.1% of the time for insertive and 15.6% of the time for receptive oral sex in the past three months. Condom use during oral sex with casual partners was similar with 17% reporting condom use during insertive and 14.4% during receptive oral sex. 40.8% of men reported having unprotected oral sex in the 12 months period preceding the survey with a partner whose HIV status they did not know.[22]

Oral Risk Behaviours among Heterosexuals

- In a study of female street youth involved in prostitution in Montreal, researchers found that condom use was extremely low

during oral sex. Only 5% of girls involved in prostitution and 4% of girls not involved in prostitution used condoms while performing fellatio.[23]

- In a study conducted in Montreal from 2001 to 2003 among street youth (14-23 years), the researchers looked at male street youth involved in survival sex (exchanging sex for money, drugs, shelter, food, etc). Condom use during oral sex was infrequent, with 85.7% reported ever having unprotected oral sex with female clients and 71.3% reported ever having unprotected oral sex with male clients. With non-client sexual partners, the numbers increased to 97.2% and 84.6% respectively. [24]

Female-to-Female Transmission of HIV through Oral Intercourse: Truth or Bias?

To date, there have been several reports of HIV transmission through oro-genital contact between lesbians (cunnilingus);[25] however, a number of researchers have suggested that bisexual activity may be underreported by gay women, and therefore that not all the cases of female-to-female transmission of HIV infection are authentic.[26]

Possible Transmission of HIV Between Heterosexual Partners as a Result of Oral Intercourse

- There are several reported cases in the literature of women who acquired HIV infection after performing oral sex on their seropositive male partner (receptive fellatio).[27]

- Cases of infection in men following oral sex with their female partners have been reported, including one in which a man was apparently infected through fellatio involving a prostitute.[28,29]

- On the other hand, a study in Madrid of 135 serodiscordant couples reported over 19,000 instances of unprotected oral sex between spouses without one seroconversion, showing that this behaviour requires further investigation.[30]

Potential Co-Factors for HIV Transmission During Oral Sex

Saliva that does not contain blood presents no potential for transmission, as research has shown that an enzyme in saliva inhibits HIV. In general, the mouth and throat are well defended against HIV: the oral mucosal lining contains few of the cells that are the most susceptible to HIV.[31] Other research notes that saliva contains several HIV inhibitors, such as peroxidases and thrombospondin-1, and that the hypotonicity of saliva disrupts the transmission of infected leukocytes (white blood cells). [32]

Case reports identify factors potentially associated with increased risk of HIV transmission through oral sex: oral trauma, sores, inflammation, concomitant sexually transmitted infections, ejaculation in the mouth, and systemic immune suppression.[14] For receptive fellatio, poor oral health and taking ejaculate in the mouth is a hazardous combination that increases the risk of HIV transmission.[33]

- In a 1996 cross-sectional study of crack cocaine smokers, oral lesions were associated with HIV infection among persons who reported receptive oral sex.[34]

- A 1993 study of female sex trade workers found that crack users who inconsistently used condoms when performing oral sex on their clients were more likely to be infected with HIV than were those who consistently used condoms when performing fellatio.[35]

- Of the eight MSM in the Options Project in San Francisco in 2000 who may have acquired their HIV infection through receptive oral intercourse, three reported oral problems, including occasional bleeding gums.[10]

Oral Sex and "Safer Sex Counselling": Existing Views and Recommendations

- The Canadian AIDS Society (CAS) currently classifies insertive fellatio between men, or between women and men, as carrying a negligible risk of HIV transmission regardless of condom use. Receptive fellatio between men, or between men and women, is classified as carrying negligible risk if a condom is used and as low risk if a condom is not used (whether or not semen is taken in the mouth). The CAS currently cautions that the risk of transmission from receptive fellatio is increased if lesions or sores are present in the mouth.[36]

- With respect to insertive cunnilingus between men and women or between two women, the CAS regards this practice as carrying a negligible risk of HIV transmission if a barrier is used and as low risk if no barrier is used (regardless of menstrual status). Receptive cunnilingus between men and women or between two women is regarded as carrying a negligible HIV risk.[36]

- Both insertive and receptive anilingus, with or without a barrier, between partners of the same sex or opposite sex are viewed by the CAS as carrying a negligible risk of HIV transmission.[36]

- The CAS emphasizes that the risk of transmission of HIV (or other STI) from any of these types of oral intercourse can be effectively reduced by the proper use of a latex barrier (condom or dental dam), and thus advocates the avoidance of unprotected oro-genital or oro-anal contact.[36]

Conclusions

The risk of HIV transmission through oral sex is difficult to assess because HIV seroconverters may underreport other higher risk sexual practices. A literature review identified exposure to HIV through unprotected oral intercourse as an independent risk factor for HIV acquisition in only three (12.5%) of 24 epidemiological studies designed to examine risk of HIV from different sexual exposures.[37] It indicates that the importance of oral sex to HIV transmission is a complex result of the relative frequency of oral sex (among other activities), the infectivity of oral secretions and its modification by oral pathology, and the resistance to infection of inhibitory substances in saliva.[37] Also, the HIV incidence and prevalence in the community, the role of antiretroviral therapy and the extent to which personal prophylaxis is adopted will influence the contribution of oral sex to HIV transmission.[37]

While oral sex is a lower risk activity than unprotected anal or vaginal intercourse, repeated exposures may increase the risk. Although the risk of acquiring HIV through oral sex is low, the higher rates of practising oral sex indicate that it may contribute to significant numbers of HIV cases among MSM. Safer sex practices should consider oral sex, particularly unprotected receptive fellatio with ejaculation, as a potential risk behaviour for HIV transmission.

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Canada

HIV/AIDS
Epi Update
Centre for Infectious Disease Prevention and Control

HIV-1 Strain Surveillance in Canada

At a Glance

- **The Canadian HIV Strain and Drug Resistance Program (SDR program) monitors and assesses HIV strains and the transmission of drug resistance among newly diagnosed and untreated individuals in Canada.**
- **Although HIV-1 strain B continues to predominate in Canada (89.9% of samples analysed), a wide variety of non-B strains have also been identified (10.1% of samples analysed).**
- **Based on results from the SDR program, the likelihood of a non-B strain infection was greater among individuals of African/Caribbean origin compared to Caucasians, and greater among those with heterosexual sex compared to male-to-male sex as the primary risk exposure.**
- **HIV strain variation may play a role in changing the nature of the HIV epidemic in Canada. It is therefore important to implement the systematic collection and analysis of data related to strain surveillance across the country.**

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Introduction

Two types of HIV have been characterized in humans, HIV-1 and HIV-2. HIV-2 is less common than HIV-1 and is mainly found in West Africa. Both HIV-1 and HIV-2 can lead to AIDS and differences in their transmission and biologic characteristics are well documented.[1] However, HIV-1 is primarily responsible for the AIDS pandemic. HIV-1 can be divided into three major groups: "M" (major), "O" (outlier) and "N" (new).[2] The vast majority of HIV strains are clustered in the M group, which is classified into subtypes (A-D, F-H, J and K), sub-subtypes as well as circulating recombinant forms (ex: AB).[3-5]

According to the WHO-UNAIDS Network for HIV Isolation and Characterization, in 2000, 47.2% of diagnosed infections worldwide were due to HIV-1 subtype C.[6] This subtype predominates in India, Southern Africa, and Ethiopia. HIV-1 subtype A (including the circulating recombinants AE and AG) was the second most commonly identified accounting for 30% of diagnosed infections worldwide. Subtype A and the recombinant AG predominate in western and central Africa, whereas the recombinant AE is more commonly found in Thailand, China, the Philippines and central Africa. Other recombinant forms accounted for 18% of diagnosed infections. Overall, HIV-1 subtype B was responsible for 12.3% of diagnosed infections worldwide, although it predominates in Canada, the USA and western Europe. However, because of travel and migration, non-B subtypes are increasingly being reported in these parts of the world. Additional subtypes and recombinant forms are constantly being discovered, largely as a result of travel and migration of populations.[7]

This *Epi Update* describes why surveillance of HIV strains is important and provides a summary of the prevalence of divergent HIV strains in Canada identified through the Canadian HIV Strain and Drug Resistance Surveillance Program.

Why Conduct HIV Strain Surveillance?

The Canadian HIV Strain and Drug Resistance Surveillance Program (SDR program) was initiated as an integrated group of projects aimed at enhancing the national surveillance of HIV. Through a collaborative approach between the provinces and the Public Health Agency of Canada (PHAC), laboratory samples (serum from treatment naïve individuals who are newly diagnosed HIV infection) and corresponding epidemiological data are sent from the provincial health laboratories to PHAC for HIV strain and drug resistance testing. The results are then shared with provincial and other stakeholders. One of the central goals of this program is to conduct the systematic surveillance of HIV subtypes in Canada in order to attain the following four main objectives:

1. **Improve HIV Diagnostics and Screening Strategies**

   The broad genetic diversity of HIV has implications for the ability of diagnostic tests to reliably detect circulating HIV strains.The sentinel arm of the SDR program, through the reference services of the National HIV and Retrovirology Laboratories, addresses this goal by testing samples with unusual test results. Based on the knowledge of circulating HIV strains, modifications can be made to current tests to ensure that all HIV-positive persons are detected upon testing. This is also relevant for ensuring the safety of the blood supply, since the tests used for screening donated blood should be able to detect circulating HIV variants.

2. **Inform Vaccine Development**

   It is important to know the distribution of the viral subtypes and intra-subtype variation to target vaccine development and testing, since the efficacy and effectiveness of vaccines may be subtype-specific.[8]

3. **Assess HIV Transmission Patterns**

   Although genetic analyses have been used to assess the spread of HIV globally, there is little consensus on whether differences in HIV subtype affect sexual[9-11] and maternal transmission rates.[12-15] Some studies note differences in the biological properties of HIV-1 subtypes.[11,14,16] Knowing the distribution of HIV variants in Canada, along with corresponding epidemiological factors, will help to assess the implications of any differences in transmissibility. The public health implications of such findings, including prevention and treatment strategies, are of special interest.

4. **Assess HIV Pathogenesis and Progression of HIV-related Diseases**

   Although the rate of HIV-related disease progression is affected by many factors, including host factors, evidence suggests that the immunologic responses may be less suppressed by HIV-2 than by HIV-1,[16-18] this needs to be clarified. Whereas some studies suggest genetic subtypes play a role in disease progression, other studies suggest the reverse. Many of these studies are reviewed by Tatt et al[8] and Hu et al.[19] Lastly, while currently available evidence suggest that currently available anti-retroviral drugs are equally effective against all HIV subtypes, certain subtypes or viruses from certain geographic regions may have a higher propensity to develop resistance against specific anti-retroviral drugs.[20,21]

Distribution of HIV-1 Subtypes in Canada

- HIV-1 subtype A was first reported 1995 from an individual of African origin.[22]
- HIV-2 was detected in Canada as early as 1988.[23]
- Results from the SDR program show that while HIV-1 subtype B continues to predominate, however 10.1% of the sampled population (n = 2,152) were infected with non-B subtypes (see Table 1 for subtype distribution).

Table 1. Distribution of HIV-1 subtypes in samples submitted to the SDR program

HIV-1 Subtype	Frequency	Percentage
B	1,934	89.9
C	124	5.6
A	24	1.1
AE*	19	0.9
AG	19	0.9
AD	12	0.6
D	6	0.3
BD	4	0.2
AB	2	0.09
AC	1	0.05
B/AG	1	0.05
BC	1	0.05
F	1	0.05
G	1	0.05
K	1	0.05
K/AE	1	0.05
K/AG	1	0.05
Total	2,152	100

* The circulating recombinant form (CRF) AE has also been referred to as subtype E.

- Results from the SDR program suggest that a significant proportion of individuals infected with a non-B HIV-1 subtype are female (compared to males), are older in age at initial diagnosis, are among those of African/Caribbean or mixed race descent (compared to Caucasians) and reported heterosexual sex as their primary risk factor (compared to male-to-male sex).

Comment

The introduction of variant HIV strains into Canada is most likely related to travel and migration patterns from regions of the world where non-B HIV-1 strains predominate. As the diversity of HIV increases, it will invariably challenge existing diagnostic tests and interpretation algorithms. Depending on the impact that strains have on vaccine effectiveness and efficacy, it may direct the course of future vaccine research and testing. Furthermore, depending on future findings related to strain-specific transmissibility, pathogenicity and treatment, HIV strain variation may play a role in changing the nature of the HIV epidemic in Canada. It is therefore important to implement the systematic collection and analysis of data related to strain surveillance across Canada.

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Primary HIV Anti-retroviral Drug Resistance in Canada

At a Glance

- **The Canadian HIV Strain and Drug Resistance Surveillance Program (SDR program) monitors and assesses HIV strains and the transmission of HIV drug resistance among newly diagnosed and untreated individuals in Canada.**
- **Preliminary observations from the SDR program of HIV drug resistance among treatment-naïve individuals with newly diagnosed HIV infection in Canada (i.e. primary drug resistance) are as follows:**
  - **The overall prevalence of primary drug resistance to at least one antiretroviral drug is 8.6%.**
  - **The overall prevalence of multi-drug resistance to two or more classes of antiretroviral drugs is 1.4%.**
  - **Primary drug resistance has been observed among both females and males, across different age groups, ethnicities, and exposure categories, in HIV-1 subtype C and recombinant subtype infections, and among recent and established HIV infections.**
- **The prevalence of primary drug resistance is similar to what has been observed in other countries where highly active antiretroviral treatment (HAART) is widely used.**

CIDPC Website:

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Introduction

Drug resistance among individuals receiving treatment (secondary drug resistance) is well documented. Resistance observed in treatment-naive individuals with newly diagnosed HIV infection, in whom resistance is presumably due to the transmission of a drug-resistant variant of HIV-1 (primary drug resistance), is less well understood; however, there is increasing evidence to suggest that transmission of drug-resistant strains of HIV is becoming more widespread in most countries where HAART is used. Currently, there are 19 anti-retroviral drugs that have been approved or are soon to be approved for treatment of HIV-1 infection in Canada.[1] Drug resistance complicates the treatment of HIV, has important implications for HIV-related morbidity and mortality, and may result in increased health care costs.

Drug resistance in treated individuals

In Canada and the United States, the prevalence of drug resistance among treated individuals (also known as secondary drug resistance) infected with HIV-1 subtype B may be as high as 78%.[2] The development of resistance to these drugs is a result of a combination of virologic treatment failure and incomplete viral suppression. Given the extensive literature and sequence data from treated individuals infected with HIV-1 subtype B, patterns of mutations associated with resistance to specific drugs have become increasingly recognizable, making it possible to recommend alternative treatment regimens; however, such data are generally not available for non-B subtypes.

Drug resistance in untreated individuals

Detection of mutations associated with drug resistance among newly diagnosed, untreated individuals (also

known as primary drug resistance) is thought to be the result of the transmission of drug resistance from a treated individual. Several studies from Europe and the United States have reported mutations associated with drug resistance in up to 20% of untreated, early or acute HIV-1 infections[3-7]; however, in general, little is known about mutations associated with drug resistance among non-B subtypes. Recent studies suggest that genotypic differences between B and non-B subtypes may lead to the identification of previously unidentified mutations associated with drug resistance in non-B subtypes as well as differences in long-term outcomes of anti-retroviral therapies.[8-9] Associated trends over time are also not well understood.

Why Conduct Primary Drug Resistance Surveillance?

Although HAART has led to a reduction in HIV-1 related morbidity and mortality in Canada and many other countries, there is a concern that its widespread use, the increased number of treatment failures and continuing risk behaviour may result in increased transmission of drug-resistant virus. The first case of primary drug resistance was reported in 1993 with the transmission of a zidovudine-resistant HIV-1 strain.[10] Since then, many reports of transmission of drug-resistant HIV strains have been published, and there is increasing evidence to suggest that the proportion of new HIV infections involving drug-resistant strains may be increasing in countries where HAART is routinely used.

Less well understood is the prevalence of primary drug resistance and the variation of this prevalence over time, geographic area and population risk group. The SDR program aims to address these questions, and the resulting information will help inform the development of any guidelines for initial therapeutic regimens and more effective HIV prevention strategies, including the prevention of vertical transmission.

Evolution of Drug Resistance

Viral resistance develops largely as a result of changes (mutations) in the genetic material that codes for the HIV reverse transcriptase (RT) and protease enzymes. Both of these enzymes are required for viral reproduction, and current antiretroviral drugs interact with them to impede their activity. Although new drugs are continually being developed, the most commonly used antiretroviral drugs that are approved for treatment of HIV infection fall into three classes: nucleoside reverse transcriptase inhibitors (NRTIs), non-nucleoside reverse transcriptase inhibitors (NNRTIs) and protease inhibitors (PIs).

Most mutations are lethal or neutral and are not associated with conferring drug resistance; however, under conditions in which treatment does not completely inhibit viral replication, virus with drug resistant mutations can develop and replicate, resulting in treatment failure. In general, it is theoretically possible for every single drug-resistant mutation to be generated daily. For some drugs (e.g. NNRTIs), a single mutation is associated with a high level of drug resistance to multiple drugs.

Methods to Identify Drug Resistance

Genotypic tests identify mutations in the viral genetic material through commercially available probes for particular mutations or through sequencing viral genes of interest. By comparing the generated sequences with databases containing resistance-conferring mutations, the presence or absence of drug resistance can be identified.

Phenotypic tests determine the enzymatic activity of viral genes or assess viral growth in increasing concentrations of drugs. Resistance is usually defined when, compared with the wild type strain, four or more times the amount of drug is required to inhibit viral growth by 50%. This test is similar in concept to antibiotic resistance testing in bacterial culture.

Note: Genotypic and phenotypic testing and interpretation for patient care are evolving fields that are extremely complex, requiring expert inputs.

Summary of Key Studies on the Prevalence of Primary Drug Resistance

Table 1 illustrates results obtained from several Canadian studies; however, it is important to note that it is difficult to make inter-study comparisons and arrive at firm conclusions because of differences in study design including study populations, types of resistance testing used, and mutations studied and reported.

Table 2 shows the results of studies on primary drug resistance that were conducted in the USA and in Western Europe. Again, this table is not meant for inter-study comparisons: such interpretations are difficult to make because of differences in study design, including study populations, types of resistance testing used, and specific mutations analyzed and reported. The results suggest that the prevalence of major mutations associated with at least one antiretroviral drug is similar to that in Canada. Of note, mother-to-child transmission of zidovudine, nevirapine, or multi-drug resistant HIV-1 has been reported in the USA and in France.[16-17]

Please see the following pages for Tables 1 and 2.

Table 1. Summary of key studies on HIV-1 primary drug resistance in Canada

Province*	Year of diagnosis	Risk exposures**	Sample size	RTIs† %	PIs‡ %	MDR¶ %	Total %
BC[11]	1996-1998	Mixed	423	1.9	1.9	0.2	3.5
QC[12]	1997-1999	IDU (26%) Sexual (69%)	81	20	6	9.9	-
QC[13]	1997	Mixed	50	12 (NRTI) 0 (NNRTI)	5	~5	-
	1998		42	6 (NRTI) 0 (NNRTI)	0	0	-
	1999		17	~18 (NRTI) ~14 (NRTI)	~18	~12	-
	2000		18	~12 (NRTI) ~6 (NNRTI)	~6	~5	-
	2001		18	0 (NRTI) 0 (NNRTI)	~6	0	-
	2002		18	0 (NRTI) ~6 (NNRTI)	0	0	-
	2003		17	0	0	0	-
ON[14]	1997-1999	MSM	23	13	-	-	-
BC, AB, SK, MB, ON, NS[15]	1997	Mixed	38	0	0	0	0
	1998		86	3.5 (NRTI)	1.2	0	4.7
	1999		325	5.5 (NRTI) 0.3 (NNRTI)	1.5	0.9	8.2
	2000		415	4.1 (NRTI) 0.5 (NNRTI)	1.2	0.7	6.5
	2001		340	4.7 (NRTI) 2.4 (NNRTI)	1.8	1.2	10.1
	2002		160	1.2 (NRTI) 1.9 (NNRTI)	4.4	1.9	9.4
	2003		192	4.2 (NRTI) 2.6 (NNRTI)	4.2	0.5	11.5

*BC = British Columbia, QC = Quebec, ON = Ontario, AB = Alberta, SK = Saskatchewan, MB = Manitoba, NS = Nova Scotia.

**Reported proportions may not add to 100% since risk exposure categories may not be mutually exclusive. IDU = injecting drug use, MSM = men who have sex with men

†RTI = reverse transcriptase inhibitors, NRTI = nucleoside reverse transcriptase inhibitor, NNRTI = non-nucleoside reverse transcriptase inhibitor. Information on NRTI and NNRTI provided where available.

‡PI = protease inhibitors

¶MDR = multi-drug resistance

Table 2. Summary of key studies on HIV-1 primary drug resistance in the United States and in Western Europe

Country	Year of diagnosis	Risk exposures*	Sample size	RTIs** %	PIs† %	MDR‡ %	Total¶ %
United States[5]	1989-1998	MSM (80%)	141	0.7 (NNRTI)	1.4	1.4	2.1
United States[4]	1995-1999	MSM (94%)	80	12.5 (NRTI) 7.5 (NNRTI)	3	3.8	16.3
United States[18]	1997-2001	Mixed	1,082	6.4 (NRTI) 1.7 (NNRTI)	1.9	1.3	8.3
United States[19]	1998	Mixed	238	3.4 (NRTI) 0.4 (NNRTI)	0	0	3.8
	1999		240	8.3 (NRTI) 2.1 (NNRTI)	1.7	1.7	10
	2000		245	6.9 (NRTI) 1.2 (NNRTI)	2	1.2	9
United States (and some samples from Canada)[3]	1995-1998	MSM	377	8.5 (NRTI, n = 213) 1.7 (NNRTI, n = 176)	0.9 (n = 213)	3.8 (n = 213)	8
	1999-2000			15.9 (NRTI, n = 82) 7.3 (NNRTI, n = 82)	9.1 (n = 88)	10.2 (n = 88)	22.7
Germany[20]	1996-1998	Mixed	64	6.3 (NRTI) 3.1 (NNRTI)	1.6	1.6	12.5
France[21]	1995-1998	Mixed	48	16.6	2	-	-
France[22]	1999-2000	Mixed	251	7.6 (NRTI) 4.0 (NNRTI)	5.2	4.8	-
Spain[23]	1996-1998	Mixed	68	16.2	6	4.4	-
Spain[24]	1997-1999	Mixed	31	16.1	9.7	0	25.8
	2000-2001	Mixed	21	0	4.8	0	4.8
Switzerland[25]	1996	Mixed	193	5.6	3	-	8.6
	1997			6.9	7.7	-	14.6
	1998			6.8	2	-	8.8
	1999			3.1	1.9	-	5
Switzerland[26]	1999-2001	Mixed	200	6.5 (NRTI) 0.5 (NNRTI)	1	1.5	10
United Kingdom[27]	1996-1997	Mixed	310	9 (NRTI) 1 (NNRTI)	1	1	10
	1998	Mixed	306	8 (NRTI) 1 (NNRTI)	2	1	9

Table 2. Summary of key studies on HIV-1 primary drug resistance in the United States and in Western Europe *(continued)*

Country	Year of diagnosis	Risk exposures*	Sample size	RTIs** %	PIs† %	MDR‡ %	Total¶ %
United Kingdom[27]	1999	Mixed	342	9 (NRTI) 3 (NNRTI)	2	2	11
	2000	Mixed	430	12 (NRTI) 4 (NNRTI)	3	1	16
	2001	Mixed	476	12 (NRTI) 4 (NNRTI)	3	2	14
	2002-2003	Mixed	161	16 (NRTI) 8 (NNRTI)	3	3	21
Europe[28]	1996-2002	Mixed	1,369	9	2	-	11

*MSM = men who have sex with men

**RTI = reverse transcriptase inhibitors, NRTI = nucleoside reverse transcriptase inhibitor, NNRTI = non-nucleoside reverse transcriptase inhibitor. Information on NRTI and NNRTI provided where available.

†PI = protease inhibitors

‡MDR = multi-drug resistance

¶Total may include major and minor mutations associated with primary drug resistance.

Comment

Primary HIV drug resistance has been observed in most countries where HAART is used. Although the interpretation of results is difficult and evolving, persons infected with drug-resistant variants of HIV may be at increased risk of drug failure despite being therapy-naïve. Surveillance of primary drug resistance is needed not only to develop guidelines for initial therapy but also to better understand and prevent the transmission of resistant HIV.

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HIV/AIDS
Epi Update
Centre for Infectious Disease Prevention and Control

Nonoxynol-9 and the Risk of HIV Transmission

At a Glance

- **Nonoxynol-9 should not be promoted as a means of HIV or other STI prevention.**
- **Nonoxynol-9 should never be used rectally.**
- **Recent data indicate that nonoxynol-9 does not reduce the risk of HIV transmission and in some circumstances may increase the risk.**
- **There is an urgent need for the development of an effective and safe anti-HIV microbicide.**

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Introduction

The purpose of this *Epi Update* is to summarize recent data on the effectiveness of nonoxynol-9 (N-9) on HIV transmission. While the effectiveness of N-9 as a spermicide is well known, its usefulness as a microbicide has been questioned, and in fact recent data indicate that it may actually increase the risk of HIV transmission especially when used rectally. This *Epi Update* examines the implications of these data in the context of HIV prevention efforts.

Background

Microbicides are substances that can substantially reduce transmission of HIV and other sexually transmitted infections (STI) when applied either in the vagina or rectum. The development of an effective microbicide is an important research objective, since it would not only improve the effectiveness of condoms in preventing disease transmission but, more importantly, it would also offer an alternative for women to protect themselves from infection without having to obtain the cooperation of their male sexual partner (to wear a male condom). Such an alternative would be especially welcome since the vast majority of global HIV transmissions occur through heterosexual activity.

An ideal microbicidal product would be effective against multiple sexually transmitted infections (STI) including HIV, safe to use several times daily, fast acting, acceptable to users, affordable, colorless, odorless, easy to obtain, store, and use, and available in a variety of preparations, including with or without a contraceptive component. None of the compounds currently in development meets these ideal standards, and experts say it is unlikely that any one product will meet them all. The immediate priority is to develop a

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microbicidal product that would provide protection against HIV.[1]

N-9 is one of the best studied products for the prevention of HIV and other STI. N-9 was initially developed as a spermicide – a chemical that kills sperm and consequently prevents pregnancy. These chemicals are used in contraceptive spermicidal products and as complementary components in the lubricant for barrier methods of contraception, such as the male condom. Studies have demonstrated that when spermicides are used alone, they are 75% to 85% effective in preventing pregnancy.[2,3] In addition, N-9 has been identified as a compound that can kill viruses and bacteria, and so was proposed as a candidate microbicide for HIV prevention. Studies have shown that in a laboratory setting, N-9 kills or stops the growth of the HIV virus as well as the pathogens of other STI such as genital herpes, gonorrhea, syphilis, trichomoniasis and chlamydia;[4] however, research has since clearly shown that N-9 is not to be used as a microbicide.

A number of products containing N-9 are licensed for use as contraceptives in Canada. These products are available without a prescription and come in a variety of forms, including creams, films, foams, gels and condoms with spermicidal lubricant. Examples of products include Delfen foam, Gynol II contraceptive jelly, Protectaid contraceptive sponge and Trojan and Lifestyle condom brands labeled as containing spermicide. Condoms both with and without N-9 make disease prevention claims based on the efficacy of the condom as a mechanical barrier.

Evidence Regarding Nonoxynol-9 and HIV Transmission

The frequent use of N-9 can induce lesions and ulcerations to genital and rectal mucosa, thereby increasing the probability of transmission of infectious agents.[5] Studies have also indicated that these adverse effects of N-9 on vaginal mucosa are dose related, supporting the notion that it has a potentially narrow margin of safety.[6] This section summarizes the available evidence regarding the use of N-9 and HIV transmission.

While laboratory studies have clearly indicated that N-9 could be an effective barrier to HIV, clinical trials in humans have produced mixed results. Several observational studies have indicated that N-9 may reduce the risk of HIV transmission, but the study design did not permit definitive conclusions.[7-10] A meta-analysis investigation that combined data from several studies concluded that N-9 may have a protective effect against both gonorrhea and chlamydia,[11] but a recent randomized controlled trial found that N-9 gel did not protect against urogenital gonococcal or chlamydial infection.[12] As well, a recent report from the World Health Organization (WHO) concluded that spermicides containing N-9 do not protect against gonorrhoea and chlamydia.[13] A recently published cohort study found no evidence of N-9 protection against HIV,[14] as was also the case in two controlled trials on this subject. One trial found no significant protection but a higher incidence of genital ulcers in the N-9 group compared with the control group,[15] and another trial found increased HIV infections in the N-9 group compared with the control group, though this difference was not statistically significant.[16]

The most significant recent data are from a study of COL-1492, a vaginal gel containing N-9, conducted between 1996 and 2000 among sex trade workers in four countries: Benin, Cote D'Ivoire, South Africa, and Thailand. The results showed that this gel had an adverse effect on vaginal integrity when used frequently, thus increasing women's susceptibility to HIV-1 infection. At low frequency use, nonoxynol-9 had no effect, either positive or negative, on HIV-1 infection.[17]

The association between N-9 and genital lesions was studied in a multi-site safety study from sub-Saharan Africa in which women applied 100 mg N-9 containing gel or a placebo gel into the vagina twice daily. The N-9 group had significantly more rate of vaginal symptoms and epithelial disruptions

as compared to placebo.[18] The safety evaluation of nonoxynol-9 gel among women at low risk of HIV infection was conducted between 1993 and 1995 at five centres wherein COL-1492 was compared with placebo gel and no-treatment control group.[19] The application of COL-1492 gel once daily for 14 consecutive days was not found to be associated with a significant level of lesions with an epithelium disruption. While it is difficult to extrapolate the findings of these studies to the general population in terms of sexual frequency, dosage and mode of N-9 use (including the occasional use of an N-9 lubricated condom), the theoretical benefits of N-9 use in such situations would have to be weighed against the demonstrated potential for harmful side effects.

Nonoxynol-9 containing products have also been sold as means of lubricants during rectal intercourse. A study compared the effect of K-Y® Plus containing 2.0% N-9 and ForPlay® containing 1.0% N-9 with placebo such as PC-515 and methyl cellulose.[20] The study showed that N-9 containing products used in the rectum can cause rapid exfoliation of large sheets of rectal epithelium within 15 minutes after application. In another study using K-Y® Plus containing 2.0% N-9, lavage and biopsy specimens were collected to evaluate the condition of rectum at various time intervals after insertion of 5 ml of K-Y® Plus.[21] The authors observed that N-9 caused rapid sloughing of sheets of epithelium within 15 minutes after insertion. The authors concluded that the rectal use of N-9 containing products may increase a person's risk of infection by HIV and other STI.

Recommendations

Considered together, the recent evidence is convincing that frequent use of N-9 does not reduce the risk of infection by HIV and may in fact increase the risk by causing disruptions and lesions in the genital mucosal lining. In the case of rectal use, even single use of a low dose of N-9 may increase the risk of infection by HIV by causing disruptions and lesions in the rectal mucosal lining. There are currently few data available to address the question of whether these results also apply to situations in which the dosage and/or frequency of N-9 use is lower (except in the case of rectal use, where there is an evidence of potential risk). The WHO has stated that N-9 clearly does not prevent HIV infection and may even favour infection if used frequently.[13] It has recommended that N-9 should not be used to prevent STI (including HIV) or for contraception if used frequently, and that N-9 not be used rectally.[22]

The United States Food and Drug Administration has proposed new warning labels for over-the-counter contraceptives that contain this spermicide.[23] The warning will state that these contraceptives do not protect against infection from HIV or other STI. The proposed label warnings would also tell consumers that the use of the contraceptives can increase vaginal irritation, which may raise the risk of contracting HIV and other STI. A number of condom manufacturers, including SSL International, Johnson & Johnson and Mayer, have voluntarily decided to stop producing condoms with N-9.[24]

Health Canada has never recommended N-9 on its own as an effective means of HIV prevention. Current assessment of the data indicates the following:

- N-9 should not be promoted as an effective means of HIV or other STI prevention. In particular, individuals who cannot use a condom for HIV prevention should not be counselled to use N-9 as an alternative.
- N-9 should never be used rectally. Even low doses used infrequently cause significant disruption of the rectal mucosal lining, which is likely to increase the risk of infection by HIV and other STI.
- For the prevention of STI, including HIV, a condom lubricated with N-9 is better than no condom at all. The protection provided by the mechanical barrier of the condom would appear to outweigh the potential

risk of the N-9, at least for low frequency of use and dosage for vaginal intercourse.

- If N-9 is used as an aid to contraception, its benefit should be carefully considered in light of the increased risk of genital lesions and the resulting potential for an increased risk of HIV transmission.

Similar recommendations have been released from the Centers for Disease Control and Prevention in the USA.[25,26]

Future Directions

These disappointing data on the ineffectiveness of N-9 as a microbicide serve to further reinforce the importance and urgency of research on the development of other possible compounds as microbicides. Other classes of compounds that show promise include topical non-nucleoside reverse transcriptase inhibitors (such as efavirenz), inhibitors of viral attachment (such as cellulose sulphate) and natural products (such as buffer gels). Recently, an experimental gel has been developed that appears to be a safe, effective contraceptive, according to animal studies. The compound known as mandelic acid condensation polymer, or SAMMA, blocked HIV and two strains of herpes simplex virus in laboratory testing.[27] In addition, there have been promising developments from a study of sulfated K5 Escherichia coli polysaccharide derivatives. These derivatives appeared to prevent infection as well as suppress HIV-1 viral replication, suggesting that their action may be specific to initial phases of viral attachment and cellular entry.[28]

There is an urgent need to develop a microbicide that can substantially reduce the transmission of sexually transmitted infections, including HIV, and that can be used by women. For individuals who are unable to access condoms or negotiate condom use, particularly women, the identification of safe and effective alternatives in HIV prevention is a public health priority.

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GLOSSARY

A *Guide to HIV/AIDS Epidemiological and Surveillance Terms* is available. The guide contains over 65 terms and over 20 frequently asked questions, and is accessible at www.phac-aspc.gc.ca/publicat/haest-tesvs/index.html. Hard copies may be obtained through the Surveillance and Risk Assessment Division, whose address is listed under the "Information to Readers of HIV/AIDS Epi Updates" section. A selected number of acronyms and terms that may be useful when reading *HIV/AIDS Epi Updates* are listed below.

ACRONYMS

AIDS	→ Acquired immunodeficiency syndrome
HIV	→ Human immunodeficiency virus
IDU	→ Injecting drug users
MSM	→ Men who have sex with men
NEP	→ Needle exchange program
WHO	→ World Health Organization

TERMS

Cohort Study

The purpose of a cohort study is to investigate the development of new occurrences of a disease or to investigate how responses to treatment are related to specific factors. These factors can be recorded at the beginning of the study and/or during the course of the study.

A cohort study starts with a group of people who will be participants in the study. This group of people is called a cohort.

The cohort is followed for a specified period, which can be weeks, months, years or decades. Follow-up data are collected at regularly defined periods either through the use of questionnaires, personal interviews, laboratory testing, medical examinations, or a combination of these methods.

A cohort study is sometimes referred to as a prospective or longitudinal study.

Co-Infection

Co-infection is having two infections at the same time. For example, a person infected with both HIV and hepatitis C (HCV), or HIV and tuberculosis (TB), has a co-infection. With co-infections the progression of either disease can potentially be accelerated as a result of infection with the other disease.

Exposure Category

In HIV and AIDS surveillance, exposure category refers to the most likely way a person became infected with the HIV virus, that is, the most likely route through which HIV was transmitted to that person.

Incidence

Incidence is the number of *new* events of a specific disease during a specified period of time in a specified population. HIV incidence is the number of *new* HIV infections occurring in a specified period of time in a specified population.

Methodology

The methodology section of a report or research study describes how the study was conducted (the methods) and the principles used by study investigators. These methods include how participants were recruited and how the data were collected, organized and analyzed.

Notifiable Disease

a disease that is considered to be of such importance to public health that its occurrence is required to be reported to public health authorities.

Perinatal Transmission

The transmission of HIV from an HIV-infected mother to her child either *in utero,* during childbirth, or through breastfeeding.

Person Years

Person years describes the length of time of experience or exposure of a group of people who have been observed for varying periods of time. It is the sum total of the length of time each person has been exposed, observed or at risk. You will sometimes see person years reported as PY or py. Person years is often used as the denominator in expressing incidence rate.

Population at Risk

The population at risk represents those persons at risk of contracting a disease.

Prevalence

Prevalence is the total number of people with a specific disease or health condition living in a defined population at a particular time. HIV prevalence among Canadians is the total number of people living with HIV infection (including those with AIDS) in Canada at a particular time.

Rate

A rate is an expression of the frequency with which an event occurs in a defined population in a specified period of time. In HIV/AIDS research, a rate can be the proportion of a population with a particular "event", such as HIV infection, occurring during a specified time period.

Risk Factor

is an aspect of someone's behaviour or lifestyle, a characteristic that a person was born with, or an event that he or she has been exposed to that is known to be associated with a health-related condition. A *behavioural* risk factor describes a specific behaviour that carries a proven risk of a particular outcome. In HIV/AIDS research, you will often see the term "HIV-related risk behaviour" to describe a behaviour that, when practised, carries a proven risk of HIV infection.

Self-Reported Data

In research studies, self-reported data is a term applied to information that is directly reported by the study participants.

Sentinel Surveillance

is a type of surveillance activity in which specific facilities, such as offices of certain health care providers, hospitals or clinics across a geographic region, are designated to collect data about a disease, such as HIV infection. These data are reported to a central database for analysis and interpretation.

Seroconversion

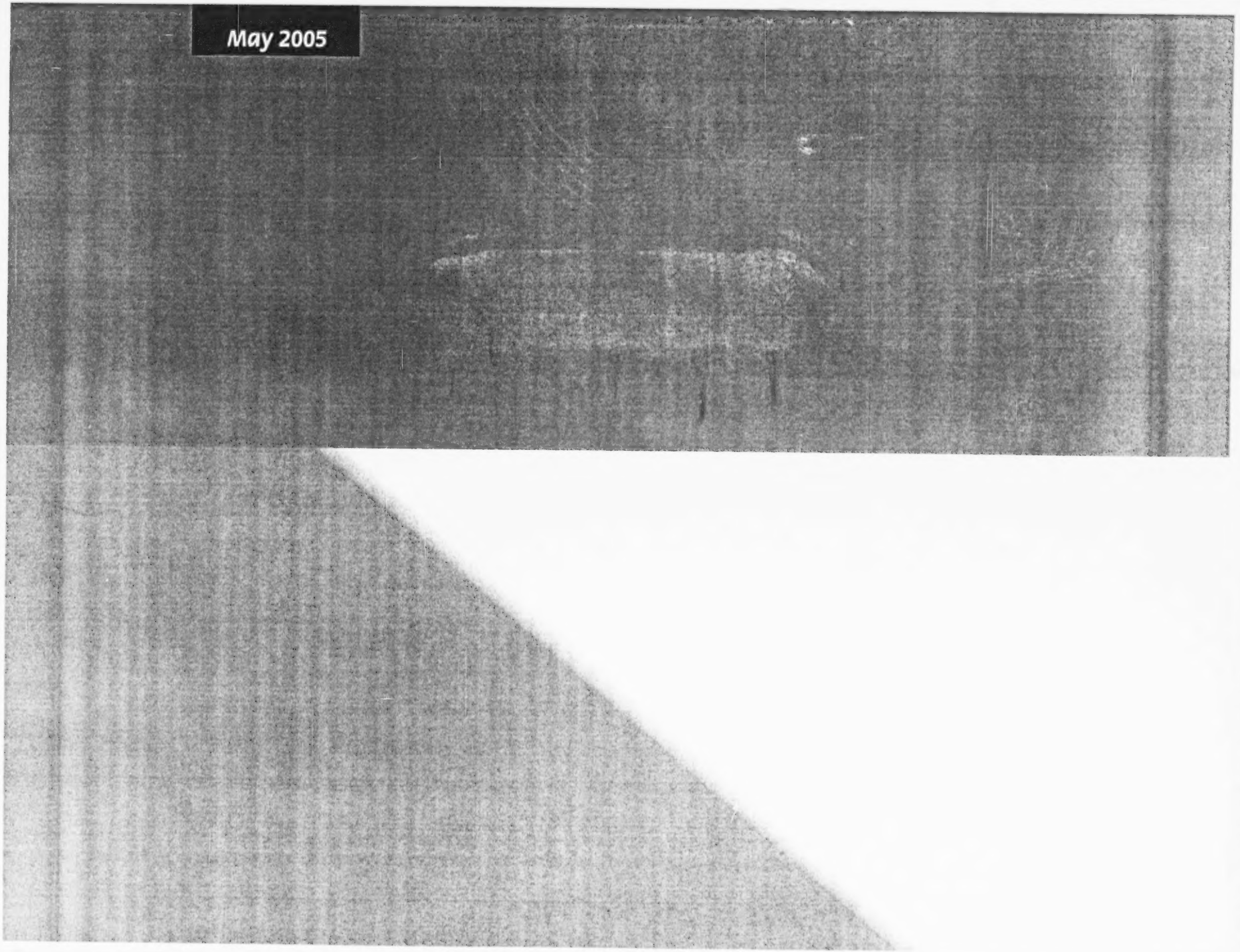
The root "sero" means the serum of the watery portion of blood. In HIV/AIDS research, seroconversion refers to the development of detectable antibodies to HIV in the blood as a result of HIV infection. A person who goes from being HIV-negative to HIV-positive is said to have seroconverted or is a seroconverter.

Seroprevalence

the terms refers to the prevalence or prevalence rate of a disease determined by testing blood rather than saliva, urine or sputum.

Surveillance

is the ongoing collection, analysis and interpretation of data about a disease such as HIV or about a health condition. The objective of surveillance is to assess the health status of populations, detect changes in disease trends or changes in how the disease is distributed, define priorities, assist in the prevention and control of the disease, and monitor and evaluate related treatment and prevention programs.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